

Journal

OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION

Feedlot Bloat

OBSERVATIONS of bloat attacks in feedlot cattle resulting from esophagitis and rumenitis. Page 503

Antibiotic Residues in Milk

A DESCRIPTION of the methods used in determining safe withholding period for milk from antibiotic-treated cows. Page 525

Calcified Lumbar Intervertebral Disk

A REPORT of the surgical correction of a calcified disk in a Dachshund. Page 540

Automatic Drinking Fountain for Dogs

AN ECONOMICAL device for providing fresh water. Page 550

Thallium Intoxication in Dogs

CLINICAL and laboratory findings in 6 dogs with thallium poisoning are reported. Page 544



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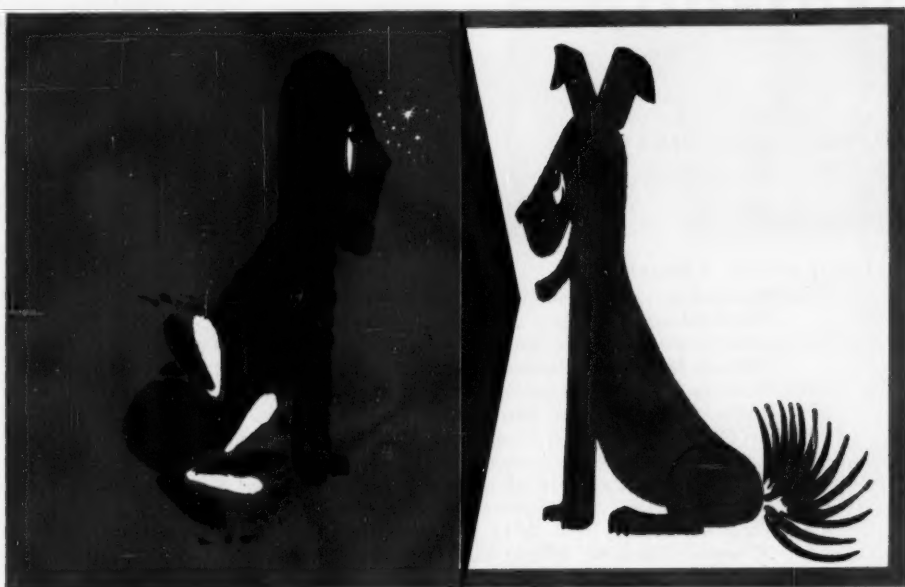
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OF THE
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MEDICAL ASSOCIATION

Vol. 137

No. 9

Nov. 1, 1960

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Correspondence

Abdominal Tumor

September 2, 1960

Dear Sir:

The paper, "An Abdominal Tumor in a Dog," by H. W. Pilcher, D.V.M., and John C. Yatsook, D.V.M., appearing in the *J.A.V.M.A.*, volume 137, (Sept. 1, 1960): 289, is one which should not have been published in its present form. It is incomplete in that it fails to include other details of the mass "which was diagnosed as a malignant neoplasm. . . ." What about supportive evaluation on the basis of microscopic findings? Impressions from gross examination alone are often very misleading.

The paper continues to be more erratic by revealing nothing about the three-dimensional aspect of the mass. What does "over 2 feet in width" imply—3 feet, 4 feet, or more? What about the use of the metric system for weights and measures? Did the mass have no color, consistency, or shape?

Subsequently in the paper, it is stated that "the patient died two days later." Where is the report of a postmortem examination?

I believe that reviewers who undertake the responsibility of examining manuscripts for publication should be more competent and critical. The *AVMA JOURNAL* is gaining little by courting reviewers who sanction papers of the type indicated above.

S/DONALD A. WILLIGAN, D.V.M.
Department of Veterinary Pathology
College of Veterinary Medicine
Michigan State University
East Lansing, Mich.

[Editor's note: Details of the pathologic findings are lacking, unfortunately, and the diagnosis could be mistaken, as Dr. Willigan has pointed out. The article was published mainly for the diagnostic value that could be obtained by studying the history of the case and for the sake of reporting the occurrence of a "tumor" of such unusual weight and size. Originally there was an accompanying photograph, but it did not reproduce well enough for publication.]

Drugs and Biological Products

September 29, 1960

Dear Sir:

I read the editorial, "On Purchasing Drugs and Biological Products," in the August 1 issue of the *JOURNAL* on pages 202-203. I hope that others read it, thought about it, and have the sincere appreciation for your efforts that I wish to express at this time. As a practitioner, may I say thank you for your concern.

S/JOHN J. UPDIKE, D.V.M.
1200 North Anderson St., Rt. 1
Elwood, Ind.

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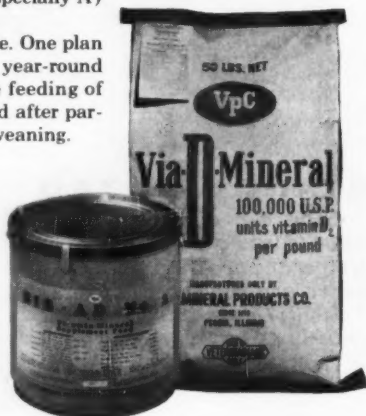
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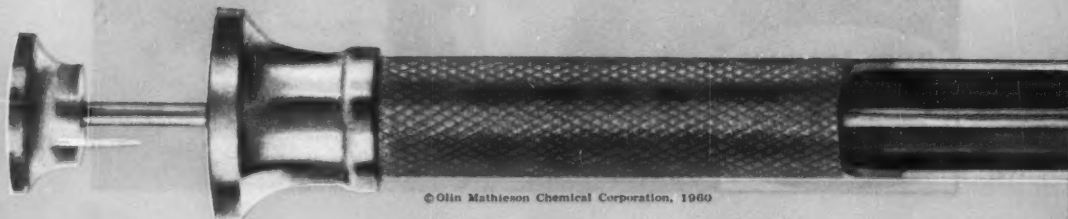


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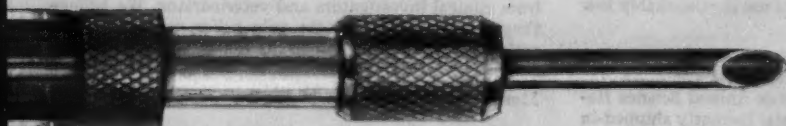
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fetus. Temperature 104°. Rapid pulse and breathing. Anorexia. *Diagnosis:* Metritis. *Treatment:* Two doses SULFABROM SOLUTION 700 cc. each. *Results:* Temperature 101.6° in 24 hours. Appetite returning". (3) "*Symptoms:* Foul hoof—limited to 'between the toes' variety with swelling. *Diagnosis:* Foot rot. *Treatment:* 700 cc. SULFABROM SOLUTION. *Results:* Eight of 11 animals walked normally in 48 hours with swelling reduced to normal or near normal. Three animals required second treatment and returned to normal in 48 hours".

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FROM THE AVMA WASHINGTON OFFICE

J. A. McCallam, VMD
Brig. Gen. USA (Ret.)

About 60 Recent Graduates May Expect Military Call

Local draft boards have completed survey of draft-vulnerable veterinarians (See JOURNAL Sept. 1, 1960, adv. p. 6). Deadline for receipt of data in National Headquarters Selective Service was early October, 1960. The next step by Selective Service, which will be based on a request from Army, would be to order for pre-induction physical examination the number required (approximately 60) as replacements for those veterinarians who are completing two years' military service, thus fulfilling their military obligation. This would become necessary because a sufficient number of recent graduates did not voluntarily apply for active duty in the Army Veterinary Corps for the fiscal year beginning July 1, 1960. Unless time permits voluntary applicants to be appointed and receive orders to active duty (January, 1961) as commissioned officers, induction into military service could result.

Draftees Will Not Receive Veterinary Officer Benefits

Public Law 85-62, June, 1957, provides that any person in a needed medical, dental, or allied specialist category may be used in his professional capacity as an enlisted man. NOTE: Those who may be inducted into military service will not receive the additional compensation that is authorized veterinary officers. Veterinarians under age 26 without prior military service should apply immediately, preferably by telegram, to Army Surgeon General, Assistant for Veterinary Service, Washington, 25, D.C., for application forms for appointment and active duty as an officer in the Army Veterinary Corps. (See JOURNAL, July 15, 1960); or get in touch with your nearest U.S. Army Headquarters and obtain the application forms.

Study of USDA Veterinary Positions Underway

Glenn O. Stahl, director, Bureau of Programs and Standards, Civil Service Commission, informed Dr. H. E. Kingman, Jr., Executive Secretary, AVMA, that the occupational study and survey of veterinary positions in the Department of Agriculture and other agencies in the federal government will start on or about Nov. 1, 1960. The study was requested in a resolution adopted by the AVMA at the meeting in Denver, August 14-18, 1960. Mr. Stahl said the Department of Agriculture, who had been consulted regarding the subject matter, will assist the Commission in making the study. Also, the Commission is expected to circulate drafts of the revised standards for review and comment to the federal agencies and other interested organizations in the spring of 1961.

Are we skating on thin ice?

Back when we were kids, we used to get a kick out of seeing how close we could skate to the edge of a deep hole without getting wet. Skating on thin ice was fun. And if we got too close, all we got was an ice-cold dunking—somebody was always around to pull us out.

Today's practicing veterinarian may be doing the same thing when he buys from a supplier who also sells direct to laymen. He, too, may be skating on thin ice. The danger is if too many skaters do this, they may weaken the ice that supports the whole livestock industry.

The question then is one of degree. How many are "too many"? Where is the breaking point, where do we all fall in? Can we stop short of the water, if enough of us continue to skate on thin ice? We hope so . . .

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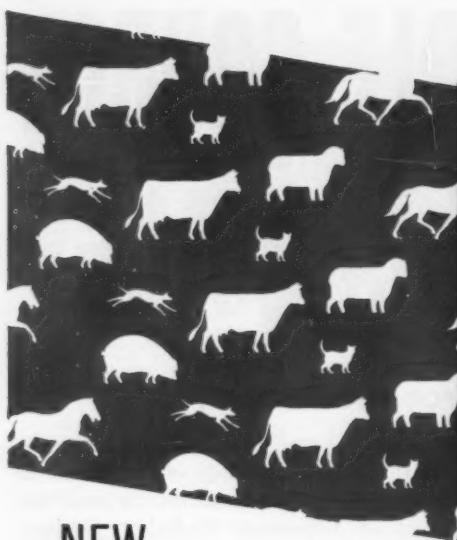
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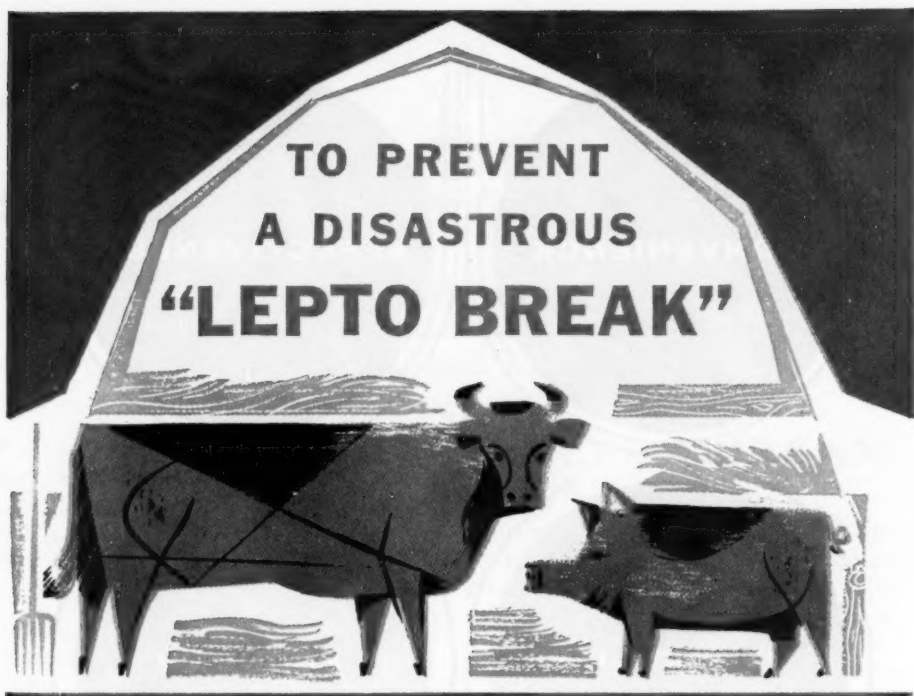
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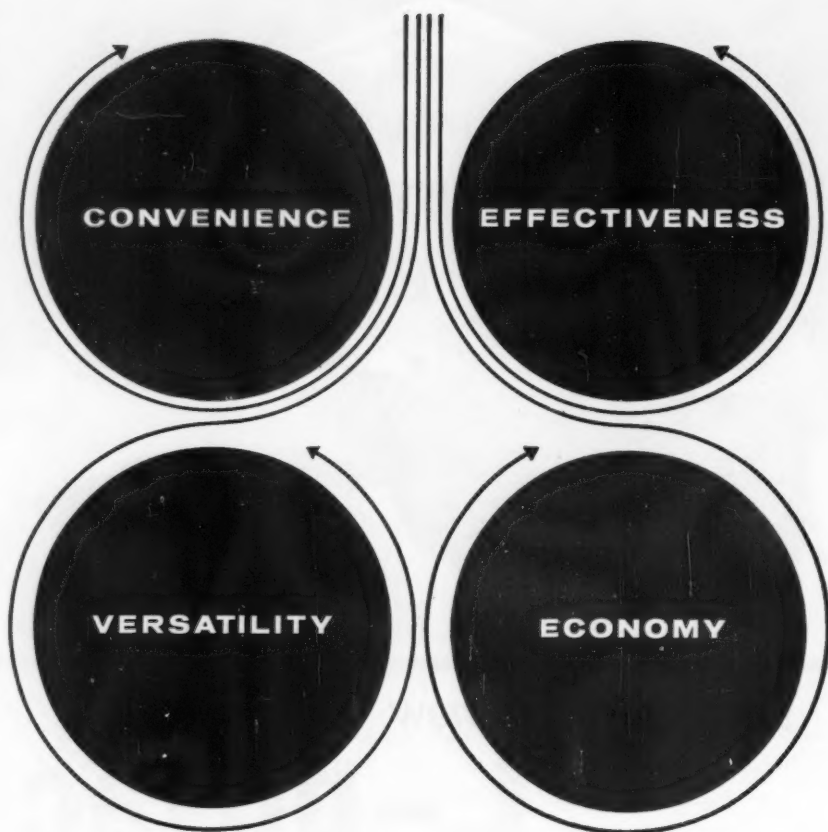
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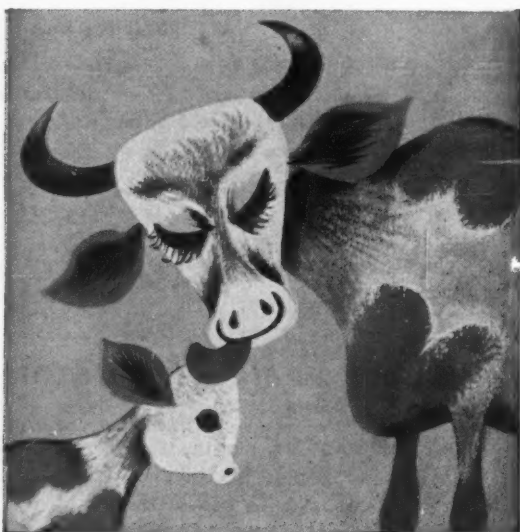
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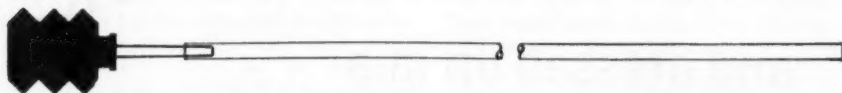
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Feedlot Bloat

Associated with Rumenitis and Esophagitis

W. D. POUNDEN, D.V.M., PH.D.

Norma A. FRANK, M.S.

V. L. SANGER, D.V.M., M.S.

N. B. KING, D.V.M., PH.D.

THIS REPORT concerns limited observations of bloat attacks in feedlot calves that apparently resulted from esophagitis and rumenitis. Esophagitis was a sequel to shipping fever; the rumenitis was associated with grain feeding. In addition, a few attacks are described in which a light fluffy foam associated with yeasts and streptococci was involved.

Little information is available on these kinds of bloat although much attention in recent years has been focused on the stable-foam variety. This type of foam occurs after cattle have been on low roughage plus heavy grain feeding for an extended period.^{2,7} Rumenitis in feedlot cattle tends to develop when grain feeding first is started.³ Thus, the bloat problems associated with it occurred early in the feeding program. Early appearance has been true also of attacks that were a sequel to shipping fever because this respiratory disease complex is encountered in general with movement of stock to feedlots.⁴

Clinical Observations and Procedures

It was possible to study 11 calves affected by bloat in which rumenitis, esophagitis,

or both were thought to be involved. All occurred in Hereford calves within a few weeks after they were brought into feedlots from pasture; 7 came from Texas and 4 were native calves. In every instance, these calves were in groups in which shipping fever had existed, and 3 of them had required treatment. However, signs of shipping fever did not exist either in the calves concerned or in their groups for several days or, in some instances, for a few weeks prior to the bloat attacks.

The only treatment required in 3 calves was removal of gas once or twice by stomach tube. Three others had to be relieved several times each, sometimes twice a day before they recovered. Restricting the quantities of feed consumed partially prevented these attacks. When bloating recurred, it usually was a result of their being fed grain again within a week.

Two other calves had to be relieved often. When it appeared that they might die from attacks, small rumen fistulas were made. Under local anesthesia, the rumen wall, except for the epithelial lining, was sutured to the skin with 4 umbilical tape mattress sutures placed in the form of a square about 3 cm. apart. An incision into the rumen was made within the square and the edges of the skin and rumen wall were brought into apposition with a continuous dermal tension suture. It was nec-

From the Department of Veterinary Science, Ohio Agricultural Experiment Station, Wooster, Ohio.

The assistance of Drs. H. R. Smith, E. W. Klosterman, and D. L. Thomas in some of these studies is gratefully acknowledged.

essary to clean the fistulas occasionally to avoid plugging. The calves were given approximately 1 gallon of fresh rumen contents and put back on hay feeding with very light grain feeding for 2 weeks. The fistulas healed within 6 weeks. At the time of slaughter some months later, few traces were evident. The average daily gain of 1 of these fistulated calves exceeded 2.5 lb. during the following 7 months.

The remaining 3 calves of the 11 died during attacks of bloat, 2 from their first attack and the third after it had numerous acute attacks, each of which was relieved by stomach tube.

Necropsy Findings

On necropsy, the 3 calves which died were found to have chronic pneumonia lesions, tracheitis, pharyngitis, and inflammation of the retropharyngeal lymph nodes. A marked inflammation of the anterior 10 cm. of the esophagus was observed in the last calf examined. Presence of this lesion was not determined in the previous 2. It is highly probable that esophagitis existed in 1 or both of these other calves, considering the inflamed conditions of their pharynxes and the opportunity for progressive spread of the inflammation to the esophagus.

Rumenitis was extensive in the ventral cavity, particularly the posterior parts, of the calf with esophagitis. In addition, numerous small inflamed foci were scattered over the entire wall of the rumen. This calf was in the same group as 1 of those which required relief by stomach tube before it recovered. Quite likely both their rumens were affected in a similar manner. The rumenitis in 1 of the other 2 that died was so extensive there was no sizable unaffected area, and the whole region around the cardia was involved. This calf was in the same pen and was fed the same ration as the first on which a rumen fistula operation was performed. Since feed caused rumenitis in 1, there is a reason to suspect that the same inflammatory state existed in the 1 operated upon. The third calf on which necropsy was performed was not examined for rumenitis.

Rumen Contents and Microbiology

The rumen contents of all 3 calves examined at necropsy were free of stable

foam and appeared normal for the kind of feed available to them. The flora and fauna were examined⁶ in 2 of them. In 1, the microorganisms were of normal balance for a mixed ration, whereas species of bacteria associated with grain rations were predominant in the other. In the other 8 calves, it was always a single large pocket of gas that was found when stomach tubes were used to relieve the accumulated gas. Collection of samples with stomach tubes⁶ also indicated that their rumens were free of stable foam. Rumen lavages and rumen inoculations⁵ were administered to 4 calves which had repeated attacks in order to reduce the quantity of grain present and decrease gas production. It is doubtful if any benefit was obtained except in 1 or 2 in which delay in onset of the next attack may have resulted.

Gas Release Mechanism

In order to determine the origin of the trouble, the efficiency of the gas-releasing mechanism was examined in 2 calves that had repeated attacks, including the first 1 in which a fistula was established. After releasing gas by stomach tube, the calves were inflated again 1 or more times by blowing into the stomach tubes and then removing the tubes. In each instance, the calves could not expel this excess gas as normal calves do. However, when examined some weeks later, after they had recovered, they were again able to eructate normally.

Attacks Associated with Yeasts and Streptococci

Three other calves were affected with bloat caused by a light fluffy foam associated with yeasts and streptococci. One was a calf that had recently been brought into the feedlot, and the attack occurred before it was put on a fattening ration. The attack was sudden and the calf collapsed and died as treatment was administered. The total contents of the rumen consisted of light, fluffy, straw-colored foam containing little feed other than a limited amount of straw. On examination of smears of the rumen contents, massive numbers of streptococci were seen in long chains, as well as numerous gram-positive yeasts with few protozoa and other usual rumen microorganisms.

The other 2 calves were yearling steers in a group of 100 that had been on feed-

lot rations for several months; 1 was affected with bloat once and the other twice, the attacks occurring a week apart. These attacks developed suddenly and were sufficiently acute in the latter to require immediate treatment. On examination of the calves by stomach tube, similar conditions existed at the time of each of these 3 attacks. There was a free gas pocket on top of the rumen contents and next to it a considerable quantity of light fluffy foam containing little or no feed. The ingesta in the ventral parts of the rumens were normal for the ration of grain and ground or pelleted alfalfa. Smears examined microscopically had unusually numerous chains of streptococci and considerable numbers of gram-positive yeast cells.

No definite reasons were found to account for the occurrence of these attacks. The calf that died had evidently been eating little of anything and what it had consumed appeared to be straw bedding. However, there may have been some connection with the fact that coarse roughage, except for straw bedding, was unavailable to the other 2 calves. Straw was added to the pens once each week. Each of the attacks occurred 4 or 5 days after the addition of the straw, which raises the question as to whether this was the source of the yeast inoculum. We have rarely observed yeasts in any of the hundreds of examinations made of normal rumen samples from many different cattle sources.

Discussion

Inflammation in the anterior part of the esophagus with related tissues, the rumen, or both, apparently is capable of producing retention of gas. Sphincter mechanisms exist at both ends of the esophagus that require proper nerve control for correct function.^{1,5} This control evidently is seriously disturbed by inflammation in the areas from which the afferent stimuli arise. The rumen wall, particularly in the cardia, is one of these areas, and probably the anterior parts of the esophagus are also sources of afferent stimuli.

These kinds of bloat attacks must be relatively common if one may judge from instances brought to our attention. These attacks need to be handled differently from the stable-foam type in which lavage, re-inoculation, and increasing roughage intake frequently produce marked improvement.

Delay in establishing rumen fistulas in cattle affected with faulty esophageal sphincter operation is inadvisable once it is evident that serious conditions exist. The time required to perform the operation is short, the resultant scar at time of slaughter is minor, and many days are saved in getting the calf on feed. Consequently, there is little to deter one from undertaking the procedure.

The light fluffy foam associated with bloat in calves differed from the more usual stable variety in that the ingesta was not incorporated into the mass. It differed, too, in that affected calves recovered rather easily, if relieved by stomach tube quickly and then continued on feed.

Summary

Bloat, apparently the result of esophagitis, rumenitis, or both, was observed in 11 Hereford calves a few weeks after entering feedlots. Esophagitis was a sequel to shipping fever, rumenitis, a sequel to initial grain feeding. The attacks were acute; free gas with no stable foam was present in the rumens, and relatively normal balances of usual rumen microorganisms were present. On investigations of some calves, made by reinflating their rumens, the mechanisms for release of free gas were seen to be nonfunctional. Reinflation proved a helpful technique in making a differential diagnosis. Three calves died from the attacks, 3 recovered after having gas released once or twice, and 5 had to be relieved several times. In 2 of these 5 calves, small rumen fistulas were made and results were satisfactory.

In 3 other bloated calves, a light, fluffy foam was involved that was associated with yeasts and streptococci. The foam was practically free of feedstuffs and quite unlike the usual stable foam associated with bloat due to high-grain, low-roughage rations. One calf died, and the other 2 recovered upon release of the gas by stomach tube.

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Hydrochlorothiazide for Treatment of Edema

In human medicine, edema has been successfully treated with hydrochlorothiazide, a salidiuretic which inhibits tubular resorption of sodium and chloride and promotes active diuresis.

Conditions in animals for which hydrochlorothiazide has been used successfully are chronic udder edema in cows and gut edema in pigs. For treating udder edema, 3 doses of 250 mg. of hydrochlorothiazide intramuscularly were given at 3-day intervals. Gut edema in pigs was treated with 1 Gm. of streptomycin and 50 mg. of hydrochlorothiazide intramuscularly. Two pigs, in which convulsions had developed, were given 50 mg. of hydrochlorothiazide in addition.—*Vet. Rec.*, 72, (June 25, 1960): 526.

Sweating Sickness

Sweating sickness is a peracute, acute, subacute, or mild tick-borne toxicosis of cattle, particularly young calves, transmitted by some strains of *Hyalomma transiens* ticks. It is characterized by pyrexia, anorexia, hyperemia, and hyperesthesia of the skin and visible mucous membranes, excessive salivation and lacrimation, serous or croupous rhinitis, epistaxis, localized or generalized profuse moist eczema, diarrhea, and diptheroid stomatitis, pharyngitis, laryngitis, esophagitis, vaginitis, or posthitis. Recovered cattle develop a durable immunity.

The causal agent of sweating sickness is a toxin and may be transmitted transovarially for at least 7 generations by the tick. Sudden appearance of the disease in calves in apparently clean areas is, therefore, not necessarily due to a fresh introduction of toxin-harboring ticks. Migratory birds may introduce the tick into regions free of the disease.

In calves, the onset is sudden, but the course of the disease varies from 4 to 20 days. There is high temperature. Moist eczema appears after 2 or 3 days, and hair in the affected areas can be pulled out easily, bringing with it tufts of epidermis, leaving a red but not bleeding surface. There is a high degree of photosensitivity.

Sheep and pigs are also susceptible.—*Onderstepoort J. Vet. Res.*, 28, (July, 1959): 3.

Pulmonary Adenomatosis

in South Carolina Cattle

C. L. VICKERS, D.V.M.
Walter T. CARLL, D.V.M.
Bert W. BIERER, V.M.D.
J. B. THOMAS, D.V.M.
H. D. VALENTINE, V.M.D.

PULMONARY ADENOMATOSIS is an acute respiratory disease, noninfectious in nature, which often, but not always, follows the ingestion of damaged or moldy feed. Since the disease was first reported in Texas in 1953,¹⁰ it has been diagnosed in other areas of the United States, chiefly Iowa and Missouri.^{8,9} This report concerns the finding of the disease in several South Carolina cattle herds during the fall and winter of 1959-1960.

Adenomatosis reportedly has a variety of causes. These include verminous pneumonia, toxoplasmosis, nonspecific pneumonia-producing bacterial organisms, oil inhalation pneumonia, exposure to noxious gases as in silo-fillers' disease, the resolution phase of chronic pneumonia, and feeding of damaged moldy feeds. In Texas, all the reported cases were associated with the feeding of moldy feeds. In a subsequent report from Iowa, many, but not all, of the cattle were being fed moldy feeds.

The fall and winter 1959-1960 in South Carolina was marked by unusually heavy rainfall and severe cold weather. Much of the corn and hay was damaged before harvesting, and the permanent pastures were affected.

The first case, subsequently diagnosed as pulmonary adenomatosis, was seen in September, 1959.⁶ Thereafter, 1 case occurred in January,¹ 2 in February,^{1,4} and 5 in March.^{2,3,7,8,11} With 2 exceptions, herds contained less than 50 cows each. The herds generally were being watered from surface ponds, but 2 were being watered from running streams. With 2 exceptions, the disease was confined to beef cattle (Hereford and Aberdeen Angus).

One exception was a dairy herd of Guernseys, the other was a mixed beef herd containing both beef and dairy cattle. All were on pasture and were being fed hay. One herd was being fed cotton seed meal as supplemental feeding, and the dairy herd was also given commercial dairy feed.

One affected herd was on a lush fescue pasture. Two other cases occurred in cattle on a good pasture of rye and oats. In all other cases, the cattle were generally on poor permanent pastures containing dry dead grass that had been frequently frozen and wet.

In one herd, cattle became affected within 24 hours after they were fed moldy sweet potatoes. New cases occurred a week later in this herd, although the sweet potatoes were removed the second day. In another herd, cattle became ill after feeding on moldy soybean hay, and in another herd, after the feeding of moldy peanut hay. The feeding of moldy or damaged feed could not be definitely established in the other cases, although the possibility existed.

In some cattle, the course of the disease was acute and death occurred before clinical signs could be observed. In the majority, clinical signs were observed. Some cattle were ill 5 days before dying. A few recovered from the illness. The cattle were depressed, inappetent, and often had an anxious expression. The temperatures were normal in all cases. Ages varied from 16 months to 8 years.

The most outstanding and consistent clinical sign in all cattle was an acute respiratory distress. In the beginning, the distress was often mild, marked only by an increase in the number of respirations and a mild dyspnea. In the terminal stages, respiratory distress was marked, the cow

From the Clemson College Diagnostic Laboratory, Columbia, S.C.

stood with head extended and made audible respiratory grunts. At least 1 case was originally diagnosed as choke. On auscultation over the thorax, dry râles could usually be heard. One heifer had a clear nasal discharge, but no abnormal nasal discharges were observed in the others. Urination and defecation appeared normal. Generalized muscular trembling was observed in 2 of the cows.

Various treatments, such as antibiotic injections, antihistamines, detoxifying agents, and calcium injections were attempted, but none proved satisfactory. Some favorable temporary response to intravenous injections of calcium solutions occurred, but there was no permanent improvement. A few cows recovered, but it is doubtful that treatment affected the course of the disease.

Nine herds were involved and necropsy of 1 cow from each herd was performed by a veterinarian. Four necropsies were conducted by laboratory personnel and 5, by practitioners. Tissues from all necropsied cattle were subjected to laboratory studies.

Gross pathologic findings were confined almost exclusively to the lungs, mediastinal and bronchial lymph nodes, and areas of subcutaneous emphysema. The lungs were enlarged, firm, and emphysematous. In many instances, they entirely filled the thoracic cavity and imprints from the ribs appeared on the serous surfaces. Large bullae were found in the interlobular septa, and interstitial alveolar emphysema was seen throughout the lungs. In 5 cattle, a subcutaneous emphysema was present over the thoracic cavity and ventral cervical region. In 1 cow, the subcutaneous emphysema extended along the back to the lumbar region. The larynx and trachea often contained a white froth. The mediastinal and bronchial lymph nodes were edematous. In 3 cattle, generalized icterus was present.

Bacterial isolations were attempted from all the internal organs; results were negative with 1 exception, a nonhemolytic *Staphylococcus* was isolated from the lungs of 1 cow.

Tissue sections were made from the liver, kidneys, lungs, heart, spleen, and mesenteric lymph nodes of each cow on which necropsy examination was performed. Microscopically, the findings were hypertrophy and hyperplasia of the pulmonary epithelium.

The alveolar capillaries were distended. Other changes in the lungs were congestion, a few spotty hemorrhages, and perivascular lymphoid hyperplasia. The bronchioles contained a mucoid exudate composed of desquamated epithelial cells. In the myocardium, areas of hyaline degeneration and of hemorrhage were found. Areas of focal necrosis, intracellular edema, and extramedullary hemopoiesis were present in the liver. A tendency toward depletion of elements was seen in the spleen. There were areas of congestion and hemorrhage in the kidneys.

Summary

Pulmonary adenomatosis occurred in 9 small herds containing a total of 296 cattle, 28 of which were affected. Of these 28, 23 died and 5 recovered. On an over-all basis, less than 10 per cent were affected but, of those affected, mortality was over 80 per cent. The predominant clinical sign was acute respiratory distress, and the outstanding necropsy finding was pulmonary emphysema. A consistent microscopic finding was hypertrophy and hyperplasia of the pulmonary epithelium. In some cattle, death occurred within a few hours, others survived for as long as 5 days. On the average, death occurred within 1 to 3 days.

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Epizootic Bovine Abortion

J. STORZ, DR. MED. VET.
D. G. McKERCHER, D.V.M., PH.D.
J. A. HOWARTH, D.V.M., PH.D.
Otto C. STRAUB, DR. MED. VET.

FOR MANY YEARS, a form of bovine abortion in which no etiologic agent could be incriminated has been widespread in California. What is believed to be the same syndrome was described as early as 1923^{1,5} and in 1957.^{5,6} The authors of the latter two reports reviewed the field aspects of the condition, described the pathologic changes, and reported on their attempts to reproduce the disease experimentally.

The disease affects both beef and dairy cattle but appears to be more widespread and severe among the former. The abortion rate is often as high as 60 per cent, particularly in herds containing a high proportion of first-calf heifers. The abortions take place usually during the last 2 months of pregnancy, although early abortions probably occur also but are undetected, particularly among beef cattle on range pastures.

The most constant gross pathologic change in the aborted fetuses is hepatopathy. This finding has recently been described in aborted bovine fetuses in Germany.² An occasional finding is an excess amount of peritoneal fluid, accompanied by hemorrhage and subcutaneous edema. Calves born during late pregnancy are usually alive at birth, but weak. In most instances, they die. There is no evidence that affected cows undergo at any time during gestation a clinical illness related to the subsequent abortion. However, in affected herds febrile reactions have been detected in cows that subsequently aborted.

Since observations indicate that repeated

abortions are rare or nonexistent, the disease was believed to be an infectious one. Since the usual bacterial causes of abortion had been largely eliminated as having no etiologic significance, viral origin was concluded as most likely.

The epizootic abortion syndrome had been studied in the past by certain of the authors of this report, but intensified investigation was demanded by the increase in the incidence and economic importance of the condition. Close coordination with various agencies in the field made it possible to obtain highly satisfactory specimens from field epizootics of the disease for etiologic studies. Two herds containing actively diseased cows were brought to the School of Veterinary Medicine at Davis for detailed study of the condition and to obtain fresh materials for investigational work. The main effort was directed toward isolating the suspected virus, though bacteriologic examinations were conducted in parallel.

Etiologic Studies

The experimental systems used in the early studies of the cause were with chicken embryos and mice. Later, when tissue culture became available, this technique was used exclusively in the etiologic studies. The cultures used were primary and low-level-passage monolayer cultures of bovine embryo kidney (BEK) cells in roller tubes, using Earle's lactalbumin medium fortified with lamb serum. Later, embryonating chicken eggs were also employed in conjunction with tissue culture.

Various tissues and fluids from aborted fetuses and aborting cows were cultured in the course of the studies described herein. These included visceral organs (cultured either separately or as pooled specimens), stomach contents, and peritoneal fluid from aborted fetuses; also placental tissues and uterine exudates of aborting cows.

Drs. Storz, McKercher, and Howarth are associated with the School of Veterinary Medicine, University of California, Davis. Dr. Straub is currently associated with the Commonwealth Scientific and Industrial Research Organization, Animal Health Division, Melbourne, Australia. The authors thank Miss E. M. Wada for the competent assistance rendered in the study described herein.

Procedure.—Materials for inoculation were minced in a mechanical blender or glass grinder with sufficient tissue culture medium for about a 10 per cent suspension. When a specimen was obviously contaminated with bacteria, the supernatant fluid obtained by low-speed centrifugation was treated with antibiotics: 5,000 units of penicillin, 2,000 μ of streptomycin, and 300 units of nystatin* were added for each milliliter of supernatant fluid. Specimens obtained under aseptic conditions were not treated before being inoculated.

While undergoing treatment, the specimens were held either at room temperature (25 C.) for 3 hours or in a refrigerator (4 C.) overnight. They were then diluted 1:5 and 1:50 in tissue-culture medium and inoculated in 1.0-ml. amounts into tubes of BEK from which the medium had just been withdrawn. The tubes containing the inoculum were incubated on a roller drum and the cultures examined daily for at least 1 week for evidence of cytopathic effects (CPE). One, and sometimes 2, subcultures were made of each specimen. The absence of CPE was taken to indicate that the specimen was negative for virus.

Results.—The BEK cultures inoculated with materials from field specimens occasionally had a somewhat unusual change—a roughened appearance of the cells, but no clear-cut CPE. Since the change, observed only in the original passage, could not be transmitted by serial culture, it was assumed to be due to toxins in the inoculum. When subculture was made to embryonating eggs, however, the true significance of the change became apparent.

On July 17, 1959, several tissues and peritoneal fluid from a freshly aborted fetus were inoculated into cultures of BEK. The cultures inoculated with the peritoneal fluid had the cell roughening on the fourth day following inoculation. The fluid phase of this culture was then inoculated by the yolk-sac route into chicken eggs that had been preincubated 6 days at 37 C. A sporadic embryo mortality occurred in late incubation. Sterility controls indicated that bacteria were not the cause. Upon subinoculation of suspensions of yolk-sac membranes of dead embryos into the yolk sacs of other fertile chicken eggs, deaths occurred sooner and the mortality rate increased. By the third passage, the death rate was 100 per cent, with mortality resulting in 5 to 7 days from inoculum diluted 10^{-2} . By the third passage, impression smears of yolk-sac membranes of dead embryos stained by Macchiavello's method⁶ revealed the presence of minute coccoid eosinophilic bodies and large basophilic

forms characteristic of the developmental stages of members of the psittacosis-lymphogranuloma-venereum (psittacosis-LVG) group of viruses. To test the possibility that these bodies were mycoplasmas, the yolk-sac material was cultured by appropriate methods¹ and found to be negative. Intranasal inoculation of infected yolk-sac suspensions into mice resulted in lung consolidation in which minute bodies and developmental forms similar to those observed in yolk-sac smears could be demonstrated by Macchiavello's staining procedure.

With the technique described, a viral agent morphologically and tinctorially identical with the original isolate was obtained in 2 other isolations from various tissues of aborted fetuses from widely separated areas in California. Two additional isolates were recovered by yolk-sac inoculation without preculture of the inoculum in BEK.

Pathogenicity Studies

The effect of this agent on cattle and its possible relationship to abortion were studied as described below.

Procedure.—A culture of the original isolate at the fifth passage level in yolk sac was inoculated intravenously into 2 cows, 1 not pregnant and 1 in the fourth month of gestation. Each animal was given 15.0 ml. of a 10 per cent suspension of infectious yolk sac in tissue-culture medium. Body temperatures were recorded twice daily, and the cattle were closely observed clinically.

Results.—The temperature of each cow rose 24 hours after inoculation and did not subside to the preinoculation level until about 96 hours after exposure. A characteristic thermal response to inoculation with this agent is shown (fig. 1). A control inoculum, consisting of a suspension of yolk sac prepared from uninoculated eggs, produced no febrile response in 2 control cows. The agent was recovered at 72 hours after inoculation from the blood stream of both test cows, and again at 96 hours from the pregnant cow by direct yolk-sac inoculation of defibrinated whole blood. The pregnant cow aborted 36 days after inoculation. The fetus appeared to have been dead for several days before being expelled. The heart, lungs, and brain of the fetus yielded the agent by direct yolk-sac inoculation.

Eight additional cows 3 to 7 months pregnant were subsequently inoculated

*Mycostatin, E. R. Squibb and Sons, New York, N. Y.

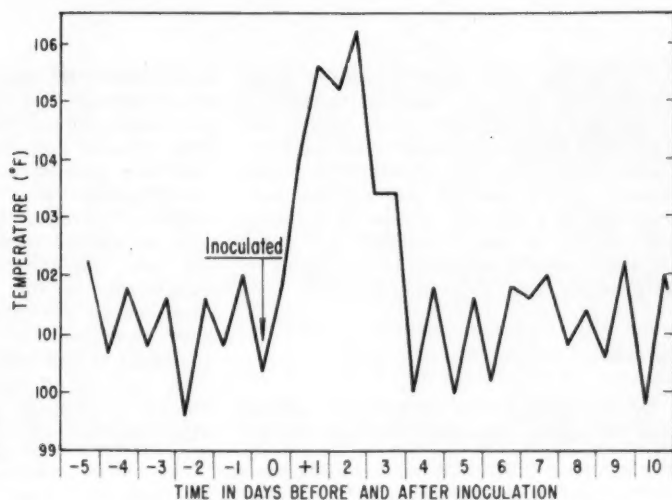


Fig. 1—Typical febrile response of cattle to inoculation with virus from epizootic bovine abortion.

with the original isolate by different routes: The fetuses of 2 were inoculated *in utero* by the muscular route, and the fetus of 1 was exposed by way of the placental vein. Two cows were inoculated intramuscularly and 3 subcutaneously. All developed a febrile response except the cows whose fetuses were inoculated.

All of the pregnant cows that were inoculated aborted. Time until abortion ranged from 11 days postinoculation (1 intramuscularly inoculated fetus) to 126 days (1 intramuscularly inoculated cow). The fetus inoculated intravenously was aborted 4 days after inoculation, but the cause was ascribed to staphylococci isolated from the fetus and uterus (probably introduced as a contaminant during inoculation). In all abortions, including calves born in late pregnancy and with no apparent abnormality except a marked weakness, the agent was recovered by direct yolk-sac inoculation from various organs of the fetuses and the newborn calves. The agent was also recovered from the uterine contents and placental tissues of 6 of 7 cows tested.

These results are summarized in table 1.

Histopathologic studies revealed that tissue changes in the aborted fetuses were identical to those in naturally occurring cases described in detail by other workers.⁷

Immunity Studies

Cross protection tests were carried out to determine whether immunity develops to re-exposure to

the agent and to ascertain the relationship of the original isolate with one isolated subsequently, and with *Miyagawanella bovis*.

Procedure.—Selected for this experiment were 4 cows that had aborted not later than 2½ months previously from experimental exposure to the original isolate. Three had been inoculated intramuscularly, subcutaneously, or intravenously, and the other exposed by inoculation into the fetus. Controls were 3 cows in the third to fifth month of gestation.

The inoculum for each control animal was 4.0 ml. of a 10 per cent yolk-sac culture suspension of each agent, and the challenge dose was 10 ml. of the same culture. Inoculations were intramuscular. Temperatures were taken twice daily, and observations were made for any alterations in clinical behavior.

Results.—Each of the 2 control animals given the viral isolates from aborting cows had a marked temperature increase like that of the cattle inoculated with the original viral isolate. The third cow, the control for *M. bovis*, reacted only with a sharp febrile peak, detected on the afternoon of the second day following exposure. Post-inoculation temperature readings before and after were in the normal range. One of the 2 cows given a challenge dose of the original isolate, and the 1 given the second isolate also had an increase in temperature, but not as marked as in the controls. The cow inoculated initially by the fetal route, which developed no fever at that time, gave on challenge a febrile response as marked as that of cattle initially exposed to the agent. The cow given a challenge dose of *M. bovis* developed no rise in temperature. All cattle remained clinically normal.

Two of the cows given challenge doses had a severe localized reaction (thickening of the skin) at the site of inoculation, and their regional lymph nodes were enlarged. These effects were not observed in a cow exposed first to normal yolk sac and subsequently to a yolk-sac culture of the original isolate. It was concluded that these reactions were a response to the agent or its products, not to the yolk proteins.

Discussion

On the basis of the evidence, it appears that the agent recovered from aborted bo-

more readily by culturing the inoculum in tissue culture first, but this step appears unnecessary since isolations were made from clinical materials by direct inoculation into yolk sacs. An important point in subinoculation is to use yolk-sac membranes of embryos that die late in incubation instead of those from embryos that die early. Rapid serial passage of yolk-sac membranes in the early studies of the cause of epizootic bovine abortion might have accounted for the failure to isolate the agent at that time.

In view of the consistency with which the agent produces abortion in cattle by experimental exposure, it appears almost

TABLE 1—Results of Inoculation of Cattle with Agent from Epizootic Bovine Abortion

Cow (No.)	No. of previous pregnancies	Stage of gestation when inoculated	Vol. and dilution of inoculum. Route	Maximum temperature (postinoc. day)	Abortion or birth (postinoc. day)	Condition of fetus or calf	Reisolation of agent from	
							Fetus or calf	Cow
373	None	Nonpregnant	15 ml. 10^{-1} i.v. [*]	106.4 F. 2nd day	-----	-----	-----	-----
375	None	4th month	15 ml. 10^{-1} i.v.	108.0 F. 2nd day	35th day	Edematous	Yes	Yes
513	None	5th month	15 ml. 10^{-2} i.m. ^{**}	106.2 F. 2nd day	33rd day	Edematous	Yes	Yes
576	One	3rd month	15 ml. 10^{-2} i.m.	106.6 F. 2nd day (36 hr.)	126th day	Dead: normal appearance. (22 lb.)	n.t. [†]	n.t.
577	One	8th month	10 ml. 10^{-2} i.m. (fetus)	Normal range	15th day	Alive but weak	Yes	Yes
578	One	6th month	5 ml. 10^{-2} i.m. (fetus)	Normal range	11th day	Dead, edematous	Yes	Yes
25	Several	8th month	1 ml. 10^{-1} i.v. (placental vein)	106.0 F. 4th day	4th day	Dead, normal appearance (68 lb.)	n.t.	n.t.
329	Several	7th month	10 ml. 10^{-1} s.c. [‡]	105.0 F. 2nd day	56th day	Alive but weak (52 lb.)	Yes	Yes
1703	Several	7th month	5 ml. 10^{-1} s.c.	105.0 F. 2nd day	80th day	Dead (27 lb.)	Yes	No
2177	Several	7th month	2 ml. 10^{-1} s.c.	105.0° F. 2nd day	40th day	Alive but weak (43 lb.)	Yes	Yes

*i.v. = intravenous; **i.m. = intramuscular; †n.t. = not tested; ‡s.c. = subcutaneous.

vine fetuses is a member of the psittacosis-LVG group of viruses. On the basis of source, morphology, and tinctorial properties, it appears that all 5 isolates represent strains of the same viral agent.

The agent apparently can be recovered

certain that it would be capable of causing the same effect under field conditions.

It is not established conclusively that this agent is the one responsible for the widespread epizootic form of bovine abortion in California. The evidence, however,

is as follows: It is known that a member of the psittacosis-LGV group of viruses is the cause of enzootic abortion of ewes.¹⁴ It has been shown,¹⁴ in fact, that the ewe abortion virus can cause cattle to abort, although only 1 cow was inoculated. Using this same agent of ewe abortion virus, other authors³ inoculated cattle via the teat canal and confirmed this finding. Still others¹³ suggested, on the basis of smear preparations and serologic studies, that a form of abortion that they studied in Germany is caused by a member of the psittacosis-LGV group of agents. The fact that the agent described herein was isolated from aborted fetuses in herds undergoing the typical epizootic form of abortion is highly significant. Another strong link connecting this agent with the abortion syndrome is the fact that the pathologic findings in the experimentally produced abortions are identical to those found in fetuses from field epizootics. Conclusive proof of the etiologic relationship of this agent to the disease under study would be a vaccine that would drastically lower the abortion rate in the field.

The febrile response of cows re-exposed to the agent is not necessarily significant. The amount of challenge virus was perhaps excessive, over-riding possible immunity. It is possible there may be no real criterion for immunity to this agent other than failure to abort. Further work is needed to clarify the situation.

With regard to the identity of this agent, the question that immediately arises is whether it is a hitherto unreported member of the psittacosis-LGV group or whether it has been described previously as the cause of a condition in some other host animal. Two other members of the psittacosis-LGV group, namely, *Miyagawanella bovis*¹⁶ and the agent of sporadic bovine encephalomyelitis (SBE)^{10,11} have been isolated from cattle.

There is no indication that *M. bovis* is involved in any known recognizable disease process of cattle other than a severe diarrhea in colostrum-deprived calves.¹⁷ *Miyagawanella bovis* has been isolated from cattle in California in situations where abortion was not involved.⁹ Furthermore, in the work reported herein, the failure of the California strain of *M. bovis* to cause anything more than a slight fever in 1 of 2 cows inoculated is regarded as strong

evidence that the 2 isolates are different members of the psittacosis-LGV group of agents. The cross immunity tests between the original isolate and *M. bovis*, described herein, were inconclusive. Studies to clarify the question are in progress.

Indications that the viral agent is a strain of SBE are no stronger than the possibility of its being *M. bovis*. Even so, there have been no reports of encephalomyelitis in cattle in any herds in which this type of abortion occurred, and none of the experimentally inoculated cattle displayed signs of involvement of the central nervous system. Likewise, there have been no reports of abortion accompanying SBE. In addition, producing SBE experimentally is sometimes difficult,⁴ and the febrile response occurs about the eighth day after exposure.¹² This is in sharp contrast to the behavior of cattle inoculated with the agent described herein.

The effect of the agent on pregnant ewes has not yet been determined.

Considerable difficulty is anticipated in establishing whether this agent is a member of the psittacosis-LGV group of viruses previously isolated. Pathologic findings and host specificity are, in the final analysis, of limited value in such a differentiation, and serologic and immunologic procedures currently available do not always provide absolutely specific differentiation. As new members of this group of agents are isolated and as the emerging epizootiologic patterns of the diseases with which they are associated become more complex, it becomes increasingly apparent that the greatest need of investigators is a method that will clearly differentiate the members of this large and complex group. Indications for the development of such a procedure do not appear particularly promising. However, a number of possible approaches which should be investigated remain to be explored.

Summary

For many years, epizootic bovine abortion in California has been recognized as the cause of extensive calf losses, particularly among heifers in their first pregnancy. Earlier studies have eliminated the usual causes of bovine abortion but failed to incriminate any agents as playing an

etiologic role. Recently, however, 5 isolations of a large, elementary-body-producing viral agent have been made from aborted fetuses obtained from herds in which the disease was prevalent.

On the basis of field observations and preliminary studies, all isolates are believed to represent a single agent. The agent appears to be a member of the psittacosis-LGV group of viruses.

Parenteral inoculation of the agent into cattle produces a marked febrile response, followed by abortion at various intervals. The time of abortion depends, apparently, on the route by which the agent is inoculated.

Field data and limited experimental study suggest that the newly isolated virus is neither *Miyagawanella bovis* nor a strain of the sporadic bovine encephalomyelitis agent. Its relationship to other members of the psittacosis-LGV group has not yet been studied.

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Rapid, Simple Test for Oxytetracycline in Milk

A simple and rapid method which can be performed in 30 minutes has been developed for detecting oxytetracycline concentrations of 0.1 μ g. or more per milliliter of milk.

The test is based on the fact that a given number of bacteria reduces 2,3,5-triphenoltetrazolium chloride (TTC) at a greater rate when the bacterial cells are packed together than when they are suspended in a liquid medium.

Studies are in progress to determine applicability of the test for detection of antibiotics other than oxytetracycline.—J. Dai. Sci., 43, (July, 1960): 999.

Cyclopian-Type Malformation

in Lambs

Wayne BINNS, D.V.M., M.S.
W. A. ANDERSON, D.V.M., M.S.
D. J. SULLIVAN, D.V.M., M.S.

A CONGENITAL MALFORMATION in lambs, characterized by deviations in the structure of the head, has recently been reported.¹ It was described as a cyclopian-type malformation which has occurred in 1 to 8 per cent of the lambs in flocks that, during the breeding season, grazed on certain alpine meadows in south central and southwestern Idaho. The changes were confined to the head and consisted of distortion or absence of some bones of the face, cyclopian deformity of the eyes, fusion of the cerebral hemispheres, and hydrocephalus. Evidence indicates that the condition is not hereditary.

This report describes and illustrates the anomalies and variations and explores whether this condition is a true cyclopia.

Review of the Literature

Cyclopia has been described as a condition in which (1) 2 complete eyes tend to be closer together than normal, (2) there is the external appearance of 2 eyes even though fused (dumbbell or hourglass eyes), (3) there is a single median eye (perfect cyclopia). The eyes may be normal in size or they may be small or even absent. Malformation of the brain may occur but is not an essential concomitant finding.⁴

The material in the anterior end of the neural plate was found to have generalized eye-forming potencies.¹ Any part of this material is capable of developing into any part of the optico-ocular apparatus. The root of the archenteron (Unterlagerung) may be the element responsible for the development of 2 bilaterally symmetrical eyes from material that has generalized eye-forming potencies.¹

From the Animal Disease and Parasite Research Division, ARS, USDA, Logan, Utah (Binns), and Denver, Colo. (Anderson and Sullivan). Dr. Sullivan is now with the Section of Experimental Pathology and Toxicology, Sterling-Winthrop Research Institute, Rennselaer, N.Y. Dr. Anderson died in May, 1960.

The forebrain in perfect cyclopia is never divided into hemispheres, but it consists of a simple sac enclosing an undivided ventricle. The diencephalon is also markedly abnormal. The midbrain may approach normality, and the more caudal parts of the central nervous system are rarely affected. In perfect cyclopia, the hypophysis is usually absent. Even when it is present, the eye may show evidence of doubling. The optic nerve may be single or absent and the olfactory bulbs may be present as a single rudimentary tract or may be absent. The tissue that is most active at the time a noxious influence is applied will be the most seriously affected. The subsequent course of events will depend on the part of the embryo affected, and a series of abnormal developmental interactions will be initiated.²

By the use of embryonating chicken eggs, it has been found that treatment of embryos of 3 or more somites with x rays usually resulted in cyclopia with 2 eyes or eye rudiments. Treatment of embryos at 18 to 22 hours of incubation produced a few cases of cyclopia with a single median eye. Cyclopia is due to a lesion which tends to arrest development of the region anterior to the first cephalic vesicle (presumptive outline of the telencephalon). Whether the insult acted on the cerebrum or on the bud of the frontal bone was not determined, since both were affected in experimental studies.⁴

Vaccination of ewes for bluetongue when they are 4 to 8 weeks in gestation may cause "dummy" lambs.³ On necropsy, some lambs had a hypoplasia of the brain with the cranial cavity filled with clear fluid, while in others the brain appeared to be of normal size with surface hemorrhages and degenerative changes.

Materials

This study was conducted on a series of 116 malformed lambs which were examined over a 4-year period from 1956 through 1959. The lambs were mostly from crossbred range ewes which had been grazed on alpine ranges in south central and southwestern Idaho. The number of lambs examined each year and the term of gestation are shown (table 1).

Of the 116 deformed heads examined, 4 were selected as representative of the varying degrees of malformation encountered. These heads were subjected to detailed examination before and after the

TABLE 1—Number of Lambs Examined Each Year and Term of Gestation

Year	No. of lambs examined	No. born at normal term	No. born after prolonged gestation
1956	34	25	9
1957	40	26	14 (6-9 weeks overdue)
1958	19	19	None
1959	23	12	11

skull was defleshed. The remaining specimens were examined by necropsy at the collection site to determine the type and the extent of the changes.

The brain changes resembled, in some respects, those observed in so-called "dummy lamb disease" which is attributed to the presence of bluetongue vaccine virus during early pregnancy. For this reason, blood serum samples were taken from 16 ewes which had given birth to malformed lambs, to determine the possible presence of significant levels of bluetongue antibodies. Of these samples, 5 were obtained in 1957, 7 in 1958, and 4 in 1959.

Observations

None of the 16 samples of blood serum from ewes which had borne malformed lambs had significant levels of bluetongue antibodies as determined by the tissue culture and the chicken embryo serum-virus neutralization tests. There was no record of bluetongue vaccination, and the histories did not indicate the occurrence of any unusual disease condition during the grazing seasons in the 4 years.

In all of the lambs of this series, the anatomical deviations were confined to the head. Otherwise, the carcasses of the 82 deformed normal-term lambs were well proportioned and of average size. The 34 lambs that were born after the gestation period had been prolonged for 6 to 9 weeks were much larger and weighed up to 26 lb. They all had extensive edema of the body tissues, with accumulations of fluid in the thoracic and abdominal cavities, and they had a characteristic long, hairlike type of wool.

In the intact heads of the malformed lambs, the most extreme deviation was a single median eye—a true cyclopia. A variation was 1 eye composed of 2 corneas in a single distorted sclera and with a single eyelid encompassing the entire struc-

ture (fig. 1). Another variation was 2 more normal appearing eyes with separate symmetrical eyelids. On dissection, however, the scleral portions of the eyes proved to be fused into a single dumbbell-like structure. In the animals with the least deformity, there were 2 properly placed eyes that were apparently normal.

A shortening of the upper jaw was a consistent finding. This gave a peculiar foreshortened appearance to the face, which emphasized the dome appearance of the cranium and probably inspired the name "monkey-faced" lambs by which these anomalies are commonly known among sheep ranchers (fig. 1). In those lambs that had been born after prolonged gestation, the incisor teeth of the protruding lower jaw were well developed and covered with a thickened layer of epithelium which gave them a strikingly exaggerated appearance (fig. 11). Another anomaly that appeared frequently in badly deformed heads was a peculiar, skin-covered, trunk-like protuberance arising in the median plane dorsal to the eye (fig. 5, 11). This was usually about 2 by 1/2 inch and contained a fibrous or cartilagenous core.

The formation of the cerebrum varied from a small rudimentary structure to what appeared to be normally divided hemispheres. In most of the lambs with extensive facial deformities, the cerebral hemispheres were fused and cystic. Olfactory bulbs were absent; some heads had an optic chiasm and other only a single optic nerve. In most instances the pituitary body was absent.

The malformed lambs were usually born alive and attempted to breathe despite the distortion or the lack of nasal cavities in most instances. Such breathing attempts were interpreted to mean that the respiratory center in the medulla oblongata was functioning and that other centers in the medulla were functional.

The 4 heads selected to illustrate the varying degrees of deformity are designated as specimens 1, 2, 3, and 4.

Specimen 1 (fig. 2, 3, 4) was born alive, presumably at normal term, and had no body deformity. The head appeared broad and the 2 eyes were normally placed. The upper jaw was short and the incisor teeth of the apparently normal lower jaw extended beyond the upper lip. The nostrils were patent but pinched and so distorted that breathing was difficult.



Fig. 1—Twin, cyclopic-type, malformed lambs, obtained alive 6 weeks past the normal parturition date. The eyes represent 2 corneas in a single, median, bony orbit.

On examination of the skull, the cranium was found to be essentially normal. The frontal bones were slightly wider than usual. The lacrimal and the malar bones were unchanged, as was the architecture of the orbit. The maxillae were drastically shortened anteriorly, and the dental arches had greater than normal curvature. Only vestigial remnants of the premaxillae were evident and the nasal bones were shortened to a quadrilateral plate. The mandible was unchanged except for an exaggerated upward curvature.

On dissection, the eyes appeared to be normal in contour and position. Both optic nerves and an optic chiasm were evident. The olfactory bulbs were present. No deviations in structure could be detected in the architecture of the brain. A pituitary body was present.

On the whole, the head malformation was minimal. However, distortion of the nostrils seriously impaired breathing and, combined with the deformity of the mouth, made suckling difficult. Lambs of this type may survive, but they do not grow normally.

Specimen 2 (fig. 5, 6, 7) was born alive at normal term but died immediately from suffocation. The body was of average size and shape except for the head, which represented a more advanced degree of deformity. The nose and upper jaw were extremely short, thus giving the face the "dished" appearance of a bulldog. A tongue of normal size protruded from the oral cavity, which was too small to contain it.

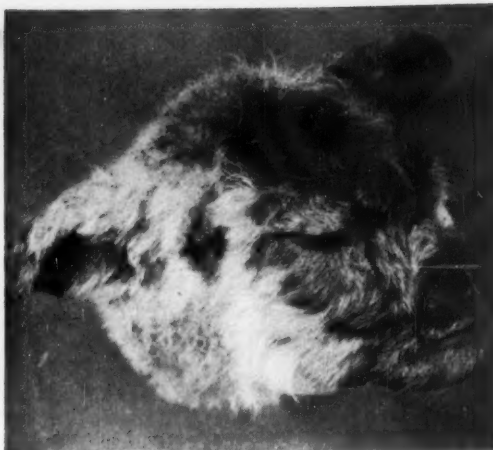


Fig. 2—Notice the slight shortening of the upper jaw of lamb's head (specimen 1). The nostrils are distorted, but patent; 2 eyes are in normal position.

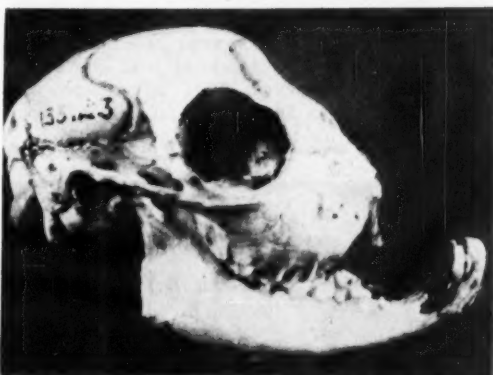


Fig. 3—The skull of specimen 1 has normal orbits, distorted maxillae, and only vestigial remnants of premaxillae and nasal bones.

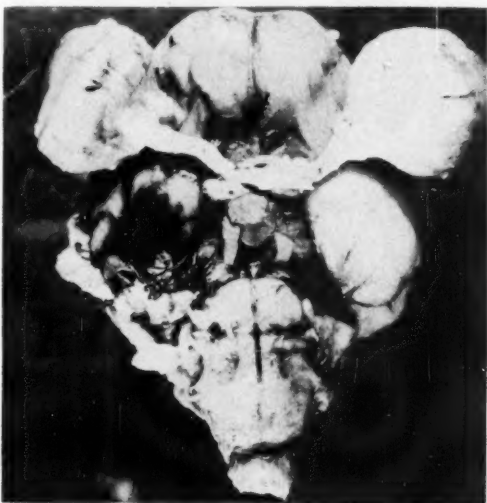


Fig. 4—Ventral aspect of a normal-appearing brain in specimen 1. Olfactory lobes, 2 eyes, and the optic chiasm are evident.



Fig. 5—Specimen 2 had a foreshortened face with the tongue protruding. Externally, the eyes appear to be separated. The forehead has a skin-covered protuberance.



Fig. 6—The skull of specimen 2 had distortion or absence of facial bones. Bony orbits form a common cavity.

There were no nares, and the nasal cavity was not patent. Externally, the eyes appeared to be paired and properly placed. A trunklike, skin-covered appendage protruded from the forehead just above and between the eyes. This appendage was more than an inch long and had a fibrous core with an opening at the end.



Fig. 7—In the ventral aspect of the brain of specimen 2, the sclera of the eyes is fused into a dumbbell-shaped structure with a single optic nerve. The olfactory lobes are absent, and the cerebral hemispheres are fused and atrophic.

The cranium was fairly well formed, and the frontal bones were the only ones that deviated markedly. These bones were fused and terminated anteriorly in a median roughened protuberance which represented the base of the appendage. The malar bones were recognizable, and the remainder of the external opening of the orbits was completed by a single plate representing the remnants of the lacrimal bones. There were 2 normally positioned external orbital openings, but no separating median wall. The orbits consisted of a single large cavity with the posterior wall formed by the fused internal plates of the frontal bones. A median foramen accommodated the single optic nerve. The maxillae were grossly distorted, and premaxillae and the nasal bones were completely lacking. The maxillae, articulated in the median plane, and the first premolars were situated on either side of the midline. The infra-orbital foramina were in such a position as to suggest rudimentary external nares, but no nasal cavity existed. No changes except an exaggerated upward curvature were evident in the mandible.

The eyes were remarkable in that there were 2 corneas, 2 lenses, and 2 anterior chambers, but there was only a single median optic nerve and, of course, no optic chiasm. The structure had a rude dumbbell shape and occupied the entire common cavity of the bony orbits.

In the brain, olfactory bulbs were not evident. The cerebral hemispheres were reduced in size and fused. There were no convolutions, and the ventricles were represented by a single large cavity, which was filled with fluid. The brain stem and the cerebellum were of normal size and shape, but no pituitary gland could be found.

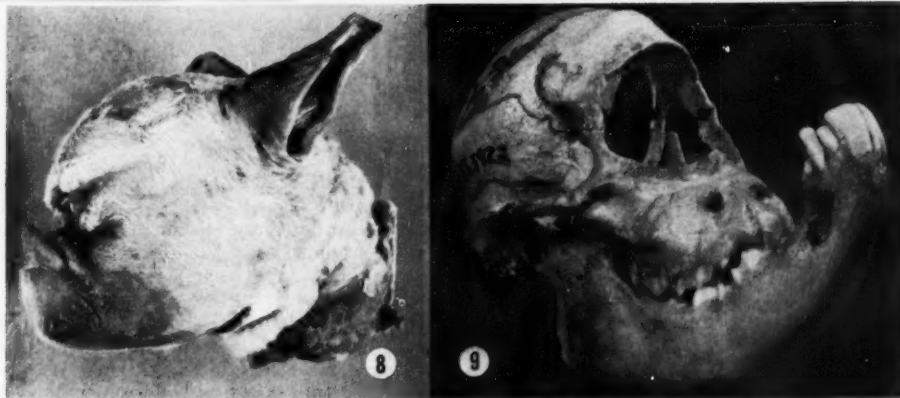


Fig. 8—Specimen 3 has a foreshortened face with tongue protruding and a single median eye.

Fig. 9—In the skull of specimen 3, the distorted maxillae articulate medially, the premaxillae and the nasal bones are absent, and the single bony orbit is median.

Specimen 3 (fig. 8, 9, 10) was from a lamb born at normal term. The malformation was confined to the head. There was a prognathous lower jaw and a protruding tongue. The upper jaw and the nose were extremely short; there were no nostrils, and no appendage protruded from the forehead. There was a single eye.

The formation of the cranium approximated normality except for the frontal bones. These were fused to form the dorsal wall of the single orbit. The malar bones were recognizable, although distorted, but remnants of the lacrimal bones could not be identified. The posterior wall of the large bony orbit was formed in part by the fused internal plates of the frontal bones and ventrally by a thin plate. Three large openings perforated the wall and communicated with the cranial vault. Nasal bones and premaxillae did not exist, and the curved maxillae articulated in the median plane. Two infra-orbital foramina resembled nasal openings. The mandible had an exaggerated upward curve but was symmetrical and complete.

There was a single median optic nerve, but no olfactory bulb was evident. The cerebral hemispheres were fused and the fissures were indistinct. The internal structure was represented by a large space filled with fluid which compressed a thin rind of cerebral substance against the wall of the cranium. Although no changes were observed in the brain stem or the cerebellum, no pituitary body was found.

Specimen 4 (fig. 11, 12) was from a lamb that had been carried at least 6 weeks past the last possible normal parturition date. The head was severely misshapen. The upper jaw and nose were extremely

flattened, and the single median eye was surmounted by a well-developed appendage. The well-developed incisor teeth were each covered by a thick layer of mucous membrane which gave them an exaggerated bulbous appearance.

The skull was badly deformed. It was composed of heavier, denser bone than the others, and the cranium was quite small. There was a single median orbit and a large oval opening in the top of the cranium. A bony prominence projected from the anterior border of the fused frontal bones and formed a base for the trunklike appendage which protruded from the forehead. The malar bones were recognizable, and the maxillae curved inward to fuse at the midline. Premaxillae and nasal bones were completely absent. The mandible, al-

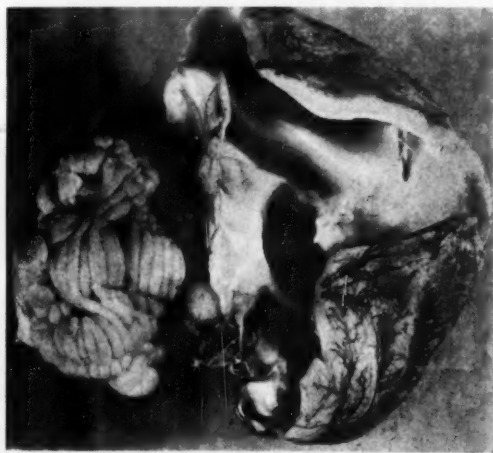


Fig. 10—The brain of specimen 3 has fused cerebral hemispheres with a large fluid-filled cavity.



Fig. 11—Severely distorted head of specimen 4 has cycloplan eye. Mucosa covers the teeth and there is a large protuberance over the eye.

though massive and somewhat misshapen, was of normal length.

The brain was so badly distorted that it could not be removed intact. It was obvious, however, that the forebrain consisted only of a fluid-filled vesicle. In this instance, the amount of fluid was so great as to force the cerebral tissue through the top of the cranium prior to complete ossification of the bones. This resulted in the large circular defect in the skull. There was no pituitary body.

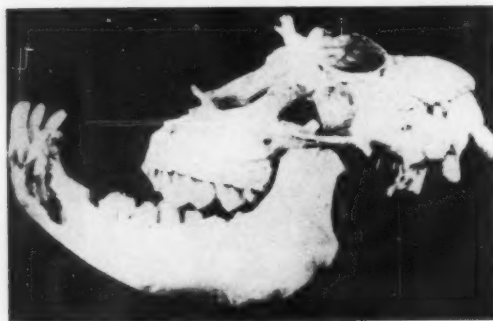


Fig. 12—Greatly distorted skull of specimen 4 with single, median, bony orbit. There is an opening in the roof of the cranium.

Discussion

Of the deformed lambs that were born at normal term, the single lambs almost invariably had only slight changes. Those that were born twin to a normal lamb may or may not have been seriously affected. We have never observed severely malformed twin lambs to be born at normal term. Specimen 1 is from a representative of the less seriously affected lambs in this group. In this instance, the brain appeared to be normal and a pituitary body was present. However, this does not hold true for all such animals, and brain damage may be encountered when the external evidence of malformation is slight.

The heads of lambs that are carried beyond normal term are always badly deformed. These have extensive brain damage and do not have a pituitary body. Such lambs may be single or twins; however, if they are the latter, both heads are malformed. Centrally placed median or dumb-bell eyes are much more prevalent in this group.

The sequence of brain changes in the order of their increasing severity appears to be as follows: In slight cases, the brain may appear to be completely normal. In the next stage, there are fusion of the cerebral hemispheres and distortion of the ventricles into a single fluid-filled cavity. The quantity of fluid may become so great that the compressed cerebral cortex appears as a thin membrane lining the cranial vault. In the most severe manifestation, the cerebrum is only rudimentary, and cerebral development has obviously never taken place.

Ewes which carry their lambs into prolonged gestation apparently have all signs of preparations for parturition at the usual time. After this time, the enlarged udder recedes rapidly, the vulva decreases in size, and the skin around the vulva becomes dark from diffuse black pigmentation. The lambs remain alive and continue to grow *in utero* for as long as 9 weeks past the last possible normal parturition date. They may attain weights up to 26 lb. After about 4 weeks in prolonged gestation, the ewes begin to lose weight rapidly and show marked difficulty in moving about. If the lambs are not removed by cesarean section, they eventually die and undergo maceration. The ewes die soon after. In this study, all of the lambs from prolonged ges-

tations were obtained alive by killing the ewes for necropsy.

Evidence suggests that the condition results from environmental factors during early pregnancy; in all probability, such a condition arises from injury to the developing nervous system of the embryo. One such possible cause of injury is anoxia with a relative intrauterine anoxia being the most probable. Since the eyes and the brain are seriously affected, it appears obvious that the damage must occur early in pregnancy, probably during the first 2 weeks.

The deviations from normal are all essentially the same and vary only in their extent. Differences in degree of derangement are probably attributable to the intensity of the insult or to the time of its action on the embryo. Regardless of the extent of the malformation, the condition is essentially cycloplan.

Summary

A congenital cycloplan type of malformation in 116 lambs was found to vary in degree of severity from a shortened upper

jaw with distorted nostrils to a single median eye with a fluid-filled, thin-walled vesicle as the forebrain and with an absence of a pituitary body. From studies completed to date, the condition does not appear to be hereditary in origin but is caused by some substance ingested by the animals early in the gestation period.

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Hydatid Disease in Man is Health Hazard in Southern United States

Hydatid disease, or echinococcosis, caused by infection with the dog tapeworm, *Echinococcus granulosus*, constitutes a recognizable health hazard in several southern states. The peril to health is of special importance among farmers and those in allied occupations where there is contact between man, sheep, pigs, cattle, and dogs. Echinococcal cysts have been reported in virtually every organ and tissue in the human host, with the liver and lungs being the 2 most common sites.

The ova of the tapeworm swallowed by man or animals penetrate the intestinal wall and are swept into the portal circulation. They embed themselves so deeply into the mucous membrane of the small intestine that they are frequently overlooked. Even in animals infected experimentally, this small parasitic cestode is extremely difficult to find.

Only a few instances of hydatid disease occurring naturally in dogs have been recorded in the United States.—*Highlights of Research Progress in Allergy and Infectious Diseases*, 1959, U.S.D.H.E.W., Pub. Health Serv. Publ. No. 745, (1959): 41.

Test for Pregnancy in Mares

Enrique SANTAMARINA, D.V.M., PH.D.
Luz Libertad JOVEN, M.Sc.

THIS REPORT deals with the procedure we found advisable for collecting and handling blood samples before and after their arrival at the laboratory for a gonadotrophin test for pregnancy in mares. Recommendations for this procedure are based on experimental work and results obtained in the diagnostic service of pregnancy tests in mares at the New Jersey Experiment Station.

Experimental Procedures

Effect of Environmental Temperature.—The effect of environmental temperatures on the gonadotrophic activity of pregnant mare serum has received little attention by those handling the blood samples before they are injected into test animals.

In a recent report,¹ we presented morphologic and histologic evidence that blood samples for pregnancy tests may lose part or all gonadotrophic activity, when exposed to environmental temperatures. The amount of activity lost is dependent upon length of exposure, degree of temperature, and gonadotrophin concentration in the blood stream.

To demonstrate the effect of a constant temperature of 26 C. on the gonadotrophic activity of pregnant mare serum (PMS), we devised the following experiment.

Blood serum from pregnant mares was assayed for gonadotrophins expressed in international units. From this serum, dilutions were made with isotonic sodium chloride solution, so that 0.5 cc. contained the desired concentrations of PMS gonadotrophin, that is 8.0, 4.0, 2.0, and 0.5 I.U.

An average of 40 female Swiss albino mice, 22 days old, were given injections of each of these solu-

tions, following the same procedure reported for the pregnancy test.^{1,2} The mice were killed 24 hours later and observed for signs of gonadotrophin-induced reactions like those present in the 24-hour pregnancy diagnosis test. About 40 mice from 15 groups each were given injections of these same 5 solutions which had remained at 26 C. for 24, 48, and 72 hours.

After a 24-hour exposure to 26 C., blood samples from pregnant mares lose their gonadotrophic activity to such an extent that samples containing about 2 I.U./cc. of serum result in a suspicious or negative pregnancy test (fig. 1). Two of the 3 mice used for this test had false negative reactions, whereas the same dosage injected at original potency resulted in a positive reaction in at least 2 out of the 3 mice used for each test. Gonadotrophic activity gradually decreased at 26 C. until, after 72 hours, it practically disappeared in samples containing low gonadotrophin concentrations. These results point out the importance of keeping the samples away from radiators or any other sources of heat, as well as from high environmental temperatures.

As a rule, blood samples which give positive reactions in pregnancy tests are stored until reports from the veterinarians concerned are received at the end of each breeding season. This permits us to repeat the tests if the mares do not foal and, consequently, to advise the veterinarians about possible abortion or resorption of the fetus.

Of those blood serum samples stored at 4 C. (36 F.) for 1 and 2 years, 156 were tested again to determine if any gonadotrophic activity was lost in this period of time. The 24-hour test was used because it is shorter and slightly more accurate than the 48-hour test in samples containing low levels of gonadotrophins.

The samples retested were taken from mares between days 39 and 120 of gestation. No loss of activity was found; thus the diagnosis for pregnancy was as accurate in the samples refrigerated for 1 to 2 years as in those tested immediately.

From the results of this experiment, we concluded that serum samples must be refrigerated until the pregnancy test can be made, if a reliable test is to be performed.

The biological test for pregnancy in the mare, based on the presence of gonadotrophic hormones in the blood serum of the mare, has proved to be the most reliable test for pregnancy. After a comparative study of the 48- and 24-hour tests, we found the 24-hour test slightly more sensitive to low concentrations of equine gonadotrophins. For this reason, we no longer use the 48-hour test. Both methods and criteria for evaluating the gonadotrophic reaction are practically the same in both tests.

From the New Jersey Agricultural Experiment Station, Rutgers, the State University, New Brunswick.

Paper of the Journal Series, New Jersey Agricultural Experiment Station, Rutgers, the State University of New Jersey, New Brunswick.

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The authors acknowledge the assistance of Dr. R. L. Squibb, chairman of the Department of Poultry Science, Rutgers University, Mr. Otto Ludanyi, technical assistant; and Dr. H. M. S. Smith. The cooperation of the following New Jersey veterinarians is also acknowledged: Drs. J. D. Case, E. R. Cushing, M. Ehrlich, A. R. Gilman, W. C. Gray, C. Lohmeyer, T. J. Lynch, L. S. Nilson, Jr., H. C. Petree, R. C. Rost, A. Singer, J. Tancola, R. L. Ticehurst, H. E. Winters, and G. L. Yeaton.

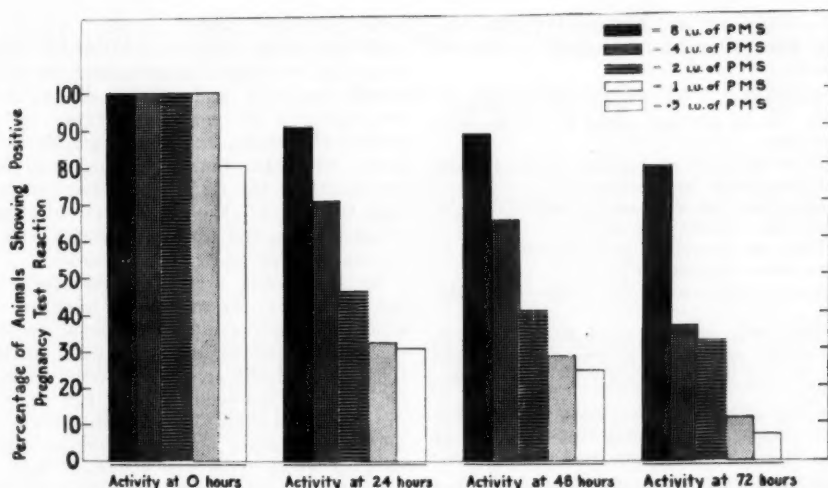


Fig. 1—Effect of a constant temperature of 26 C. at 24, 48, and 72 hours on the hormonal activity of various concentrations of gonadotrophic hormones present in blood serum of pregnant mares (PMS).

With the cooperation of New Jersey veterinarians, we were able to keep accurate records on 355 mares in which pregnancy was diagnosed. From the practical point of view, both tests approached 100 per cent accuracy (table 1). The 3 errors recorded were false positives. When the samples were retested at the end of breeding season, test mice had a strong pregnancy reaction in all cases. The interpretation that we may offer in these cases is that the mares aborted, resorbed the fetus, or had gonadotrophin-producing tumors in the reproductive organs.

Resorption of the fetus and unnoticed abortions occur often. For this reason, we advise veterinarians and horse breeders always to have the biological test performed, in order to substantiate the clinical examinations. In our estimation, this is the only way of ascertaining when the mare is having breeding difficulties.

Method of Collecting and Handling Blood Samples

In addition to the tests performed by the authors,^{1,2} experience was gained by study

TABLE 1—Summary of Efficiency of Diagnosing Equine Pregnancy Based on Presence of Gonadotrophic Hormones Using Immature Female Swiss Albino Mice in the 24- and 48-Hour Tests

Stage of pregnancy (days)	No. of cases	Diagnosis of pregnancy		Accuracy (%)	Clinical diagnosis
		Neg.	Pos.		
39-59	112	91	21	99.1	Error (1)*
60-79	65	52	13	100	Correct
80-89	31	26	5	100	Correct
100-120	32	27	5	100	Correct
No record	115	76	39	98.3	Error (2)*
Totals	355	272	86	99.1	

*Repeated tests were positive for pregnancy.

of the reasons for success and failure in performing diagnostic tests by other workers. Based on our experience and experiments, these are our recommendations for achieving accuracy in the test for pregnancy.

Desirable Time for Collecting Blood Samples.—A common cause for failure in this test is that samples have been collected too early or too late for detecting gonadotrophic hormones. Since concentration of gonadotrophic hormones in a mare's serum reaches its maximum between days 50 and 80 of gestation, this is the proper time for collecting the blood samples. Beginning with gestation day 40, concentration of gonadotrophins increases rapidly. After 90 to 100 days of gestation, the concentration gradually declines until it disappears toward the end of 5 months of gestation. Nevertheless, a person experienced in performing the mouse test will obtain accurate diagnoses with samples collected between 40 and 120 days of pregnancy. In some cases, the positive test obtained from serum collected after gestation day 120 may be due to the high concentration of estrogens present at this stage of gestation, but this does not impair diagnosis of pregnancy.

Procedure for Collecting and Handling Blood Samples.—To avoid spoilage of the

blood samples or loss of gonadotrophic activity, the following procedure is recommended:

- 1) Draw 10 cc. of blood under sterile conditions from the jugular vein and collect it in a sterilized tube or bottle.
- 2) Allow the blood to coagulate in the container at room temperature for 1 to 2 hours.
- 3) Free (ring) the clot from the walls of the tube or bottle with a sterile glass stirrer.
- 4) Place the sample in the refrigerator at 4 C. until the serum clears (2 to 6 hours).
- 5) Separate the serum by decantation or centrifugation.
- 6) The serum may be stored at 4 C. for any length of time until it is convenient to perform the test or to send the serum to a laboratory for diagnosis.
- 7) Serum samples may be shipped to the laboratory for pregnancy tests provided that they are not delayed in the mail, especially during hot weather.

We often receive whole contaminated blood that has been improperly handled or has been in the mail for several days. In such cases, we centrifuge the samples, and then add antibiotics to the decanted serum. The antibiotic-treated serum is placed in the refrigerator (4 C.) at least 6 hours in order to allow the drug to complete its antibacterial action.

In our laboratory, we have successfully used penicillin at the concentration of 1,000 units/cc. of blood serum and dihydrostreptomycin at the concentration of 250 μ g./cc. of serum. The combination of these antibiotics, rather than the use of only 1 of them, has the advantage of effectively inhibiting growth in blood serum of both gram-positive and gram-negative organisms.

Summary and Conclusions

Diagnosis of pregnancy in the mare can be made in the laboratory with practically 100 per cent accuracy. The tests, based on the presence of gonadotrophic hormones in

pregnant mare serum (PMS) should be used systematically, not as a substitute but as an aid to clinical examination for pregnancy. An early and reliable diagnosis of pregnancy is of most importance in the control of sterility and breeding difficulties. Horse breeders should bear in mind that resorption of the fetus, unnoticed abortion, and tumors of the reproductive organs happen often, and that such causes may be responsible for an error in diagnosis.

In performing a reliable laboratory test for pregnancy, the method of handling the samples is important: (1) blood samples should be collected under sterile conditions from the jugular vein; (2) samples should be obtained between 40 and 120 days of pregnancy, preferably between 50 and 80 days of gestation; (3) the samples should be kept away from any source of heat or high environmental temperatures; (4) the blood serum can be stored in the refrigerator at 4 C. for any length of time without losing gonadotrophic activity; (5) blood samples that show signs of bacterial contamination should be treated with penicillin (1,000 units/cc. of blood serum) and dihydrostreptomycin (250 μ g./cc. of blood serum) at least 6 hours prior to injection into the test mice.

Following the above recommendations and using 3 Swiss albino mice, 22 days old, per sample, this biological test proved to be the most simple and reliable test for pregnancy in mares.

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First State Humane Slaughter Bill Introduced

A state humane slaughter bill, patterned after the federal law, has been approved by a special subcommittee of the Connecticut State Legislative Council which will recommend it to the 1961 general assembly. The bill would empower the Department of Agriculture, Conservation, and Natural Resources to set up humane slaughter standards.—*Nat. Prov.*, 143, (July 16, 1960): 42.

Antibiotic Residues in Milk

After Parenteral and Oral Administration in Cows

William W. WRIGHT, PH.D.
LaVerne C. HAROLD, D.V.M.

THE PRESENCE of antibiotics in milk constitutes adulteration under the Federal Food, Drug, and Cosmetic Act. Penicillin in milk is considered a special public health problem, since this antibiotic is a highly active antigenic substance and even small concentrations can cause reactions in individuals acutely sensitive to it.²

Antibiotics may get into milk in several ways. Perhaps most commonly they get there as a result of intramammary infusion of antibiotics for treatment of mastitis. Antibiotics applied in this manner are eliminated almost exclusively in the milk, and milk from treated cows should not be used for human consumption for 72 hours after treatment. When this limitation is preempted and milk is used too soon after treatment, contamination with significant amounts of antibiotics is a virtual certainty.

There is a possibility that antibiotics may be added to milk deliberately as a preservative measure. This is obviously an illegal and dangerous practice.

Antibiotics can also reach the milk after oral or parenteral administration in cows

for treatment of numerous infections. However, unlike the situation with milk from cows given intramammary infusion, it usually has not been understood by milk producers that milk from cows given systemic treatment should be discarded.

While there is a plethora of data available on the amounts and duration of antibiotics in milk after intramammary application,⁴ comparable data related to parenteral or oral administration of antibiotics are scanty. The following experiments were performed to obtain data which could be used as a basis for determining what the withholding period should be for milk from cows treated by parenteral or oral means.

Materials and Methods

Sixteen Holstein-Friesian cows in various stages of lactation were used. The following penicillin products were administered by intramuscular injection: (1) potassium penicillin G dissolved in water to give 400,000 units/ml.; (2) procaine penicillin G in aqueous suspension; (3) procaine penicillin G in dihydrostreptomycin solution; (4) penicillin G diethylaminoethylester hydriodide plus dihydrostreptomycin for aqueous injection; (5) procaine penicillin G in oil with 2 per cent aluminum monostearate (PAM); (6) benzathine penicillin G in aqueous suspension; (7) benzathine penicillin G plus procaine penicillin G in aqueous suspension.

Each of the above products was administered at 3 dose levels, based on the penicillin content, namely, 2,000, 5,000, and 10,000 units per pound of body weight. A single dose was administered to each of 2 cows at each dose level, and in addition 2 cows were given a course of 5,000 units per pound on 3 successive days, except for product (4) above. The cows were selected so that, if possible, each pair represented a low and a comparatively higher milk producer. Tetracycline hydrochloride was administered intramuscularly and intravenously at a dosage of 2 mg./lb. The following antibiotics were administered orally: penicillin tablets (1,000,000 units once

From the U. S. Department of Health, Education, and Welfare, Food and Drug Administration, Washington, D.C. Dr. Wright is director of research, Division of Antibiotics, Bureau of Biological and Physical Sciences, and Dr. Harold is assistant veterinary medical director, Bureau of Medicine.

This work was done in cooperation with the Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Md., who furnished the cows used in the experiments. The authors appreciate the assistance of Richard W. Brown, V.M.D.

The participation of the following personnel of the Food and Drug Administration is acknowledged: Paul C. Underwood, D.V.M. (chief, Veterinary Research Branch, Bureau of Medicine), Bernard Arret, M.S. (chief, In Vitro Testing Branch, Division of Antibiotics), and Jerome Wilner, B.S. (supervisor, Plate Assay Section, Division of Antibiotics). The samples were faithfully transported by Corelli Joy.

Presented before the Section on Public Health and Regulatory Veterinary Medicine, 97th Annual Meeting of the AVMA, Denver, Colo., Aug. 14-18, 1960.

TABLE 1—Intramuscular Potassium Penicillin G Solution (400,000 u./ml.)

Cow	Dose		Milk prod. lb./day*	Penicillin (u./ml.) in milk						
	Total u.	u./lb.		Days:** 1/4	1	1 1/4	2	2 1/4	3	3 1/4
4323	2,400,000	2,000	16.3	0.056	0.01	0	0	0	0	0
4111	2,550,000	2,000	29.8	0.085	0.02	0	0	0	0	0
4342	5,500,000	5,000	22.0	0.102	0.02	0	0	0	0	0
3649	8,000,000	5,000	43.8	0.140	0.02	0.03	0	0	0	0
4370	10,000,000	10,000	21.6	0.042	0.05	0.02	0	0	0	0
3557	13,000,000	10,000	36.6	0.084	0.07	0.12	0	0	0	0
3412	7,115,000 x 3†	5,000 x 3	14.8	0.295	0.138	0.048	0	0	0	0
3924	7,345,000 x 3	5,000 x 3	52.5	0.072	0.032	0.016	0	0	0	0

*Measured 1 day after the injection or, in the case of the 3-injection schedule, on the day of the second injection.

**Days after injection. Control milk specimens, taken before the injections, were negative.

†Dose given on 3 successive days. Penicillin concentrations are for days after third injection.

daily for 10 days, and 2,500,000 units twice daily for 5 days), zinc bacitracin capsules (21,000 units once daily for 10 days), streptomycin sulfate capsules (0.5 Gm. twice daily for 5 days), chlortetracycline hydrochloride (0.25 and 1.0 mg./lb. of body weight twice daily for 5 days, and 5 mg./lb. twice daily for 3 days), and oxytetracycline and tetracycline (5 mg./lb. twice daily for 3 days).

Collection of Samples.—The cows were milked at approximately 8 a.m. and 2 p.m. Control samples of milk were taken before each treatment began. Samples consisted in every case of an 8-ml. composite of milk taken from each quarter at the start of milking and a like amount of the strippings, taken after the cows had been milked almost completely dry with a suspended-type milker.

Assays.—The samples were usually assayed on the day collected, but occasionally when necessary they were kept in the refrigerator for a day or two before assay. The overnight cylinder plate assay technique⁷ was used, with *Sarcina lutea* being the assay organism for penicillin, *Bacillus subtilis* for streptomycin, *Micrococcus flavus* for bacitracin, and *Bacillus cereus* var. *mycoides* for the tetracyclines.

Results of Parenteral Administration

Potassium Penicillin G Aqueous Solution.—After intramuscular injection of potassium penicillin G in solution (400,000 units/ml.) into a cow, penicillin is detected in the milk for only 24 hours after a dose of 2,000 units/lb. of body weight, and for up to 30 hours after doses of 5,000 or 10,000 units/lb., or after the last of three daily doses of 5,000 units/lb. (table 1). These findings agree with those who found that doses of 5,000 units/lb. generally resulted in concentrations in the milk of at least 0.032 units/ml. for 24 hours.^{9,11} However, one investigator did not determine when penicillin was actually eliminated from the milk. On injecting a solution of sodium penicillin G containing approximately 200,000 units/ml. into 3 cows at a dose of about 8,300 units/lb., an average concentration of 0.06 unit/ml. has been

TABLE 2—Intramuscular Procaine Penicillin G in Aqueous Suspension (300,000 u./ml.)

Cow	Dose		Milk prod. lb./day*	Penicillin (u./ml.) in milk								
	Total u.	u./lb.		Days:** 1/4	1	1 1/4	2	2 1/4	3	3 1/4	4	4 1/4
3672	2,412,000	2,000	23.6	0.008	0.02	0.02	0	0	0	..	..	..
3834	2,790,000	2,000	41.0	0.006	0.03	0.02	0.007	0	0	0	..	..
3749	7,345,000	5,000	16.1	0.027	0.074	0.044	0.013	0	0	0	..	..
4435	5,400,000	5,000	37.2	0.016	0.051	0.050	0.032	0.021	0.009	0	0	0
3916	12,850,000	10,000	26.5	0.051	0.188	0.140	0.049	0.040	0.020	0.014	0	0
4444	11,530,000	10,000	40.3	0.078	0.088	0.052	0.018	0.012	0	0	0	0
3629	7,260,000 x 3†	5,000 x 3	48.7	0.224	0.139	0.110	0.012	0	0	0	0	0
4370	5,880,000 x 3†	5,000 x 3	18.3	0.125	0.084	0.082	0.038	0.014	0	0	0	0

*Measured 1 day after the injection or, in the case of the 3-injection schedule, on the day of the second injection.

**Days after injection. Control milk specimens, taken before the injections, were negative.

†Dose given on 3 successive days. Penicillin concentrations are for days after third injection.

TABLE 3—Intramuscular Procaine Penicillin G in Dihydrostreptomycin Solution (200,000 u. plus 0.25 Gm./ml.)

Cow	Dose		Milk prod. lb./day†	Days:‡§ 1/4				Penicillin (u./ml.)				Dihydrostreptomycin (μg./ml.)							
	Total u.	u./lb.		1	1 1/4	2	2 1/4	3	3 1/4	1/4	1	1 1/4	2	2 1/4	3	3 1/4	4		
3749	2,600,000	2,000	21.5	0.009	0.02	0.01	0	0	0	0	0	0.39	0.46	0	0	0	0		
4435	2,000,000	2,000	38.4	0.032	0.01	0	0	0	0	0	0	0.46	0	0	0	0	0		
3916	6,000,000	5,000	28.1	0.190	0.05	0.02	0.01	0	0	0	0	6.96	1.48	0.46	0	0	0		
4444	5,000,000	5,000	42.0	0.076	0.05	0.01	0	0	0	0	0	1.66	0.35	0	0	0	0		
3629	14,000,000‡	10,000	46.3	0.490	0.120	0.04	0	0	0	0	0	6.96	0.31	1.14	0	0	0		
4420	7,800,000	8,700	35.8	0.085	0.160	0.02	0	0	0	0	0	1.48	0	0	0	0	0		
3834	7,805,000 x 3‡	5,000 x 3	45.7	0.094	0.074	0.038	0.025	0	0	0	0	2.94	0	0.62	0.54	0	0		
4111	7,350,000 x 3‡	5,000 x 3	17.0	0.295	0.159	0.119	0.012	0	0	0	0	8.96	0	1.60	0	0	0		

†Measured 1 day after the injection or, in the case of the 3-injection schedule, on the day of the second injection.

‡Days after injection. Control milk specimens, taken before the injections, were negative.

‡Dose given on 3 successive days. Penicillin concentrations are for days after third injection.

‡Dose divided and administered at 2 injection sites.

TABLE 4—Intramuscular Penicillin G Diethylaminoethylester Hydrochloride plus Dihydrostreptomycin (160,000 u. plus 0.2 Gm./ml.)

Cow	Dose			Milk prod. lb./day*	Antibiotic in milk													
	Total u.	u./lb.	Days** ¼		Penicillin (u./ml.)				Dihydrostreptomycin (µg./ml.)									
					1	1¼	2	2¼	3	3¼	¼	1	1¼	2	2¼	3	3¼	
3412	2,600,000	2,000	27.8	0.72	0.10	0	0	0	0	0	0	1.40	0.93	0	0	0	0	0
3924	2,800,000	2,000	40.5	1.25	0.07	0	0	0	0	0	0	1.42	0.54	0	0	0	0	0
3412	7,115,000	5,000	27.9	0.67	0.40	0.008	0	0	0	0	0	1.26	2.86	2.32	0	0	0	0
3924	7,350,000	5,000	49.4	1.12	0.245	0	0	0	0	0	0	0.84	0.67	0	0	0	0	0
4370	11,530,000‡	10,000	22.0	6.20	0.280	0.130	0	0	0	0	0	7.80	1.55	1.68	0	0	0	0
4444	11,530,000‡	10,000	38.0	6.90	0.171	0.020	0	0	0	0	0	2.34	0.94	0	0	0	0	0

*Measured 1 day after the injection or, in the case of the 3-injection schedule, on the day of the second injection.

‡Days after injection. Control milk specimens, taken before the injections, were negative.

‡Dose divided and administered at 2 injection sites.

TABLE 5—Intramuscular Procaine Penicillin G in Oil (300,000 u./ml.)

Cow	Dose		Milk prod.		Penicillin (u./ml.) in milk						
	Total u.	u./lb.	lb./day*	Days:** 1/4	1	1 1/4	2	2 1/4	3	3 1/4	3
3412	2,846,000	2,000	28.1-24.9	0	0.034	0.038	0.011	0.010	0	0	0
3524	2,940,000	2,000	59.5-52.4	0	0	0	0	..	0	0	..
3672	7,000,000	5,000	27.8-22.4	0	0.016	0.020	0.012	0.022	0.012	0.026	0.013
3834	7,350,000	5,000	55.4-49.4	0	0	0	0	..	0	0	..
3916	12,850,000	10,000	27.8-23.9	0.005	0.027	0.034	0.028	0.030	0.040	0.056	0.051
3649	17,910,000†	10,000	56.0-52.3	0.078	0.157	0.104	0.084	0.068	0.066	0.046	0.020
3629	5,100,000 x 3‡	5,000 x 3	35 -41	0.103	0.052	0.036	0.023	0.018	0.010	0.007	0.003
3749	5,100,000 x 3‡	5,000 x 3	30 -30	0.236	0.093	0.064	0.035	0.038	0.026	0.023	0.014

*Measured 1 day and 8 days after the injection or, in the case of the three-dose schedule, 3 and 10 days after the third injection.

**Control milk specimens, taken before the injections, were negative.

TABLE 6—Intramuscular Benzathine Penicillin G in Aqueous Suspension (300,000 u./ml.)

Cow	Dose		Milk prod.		Penicillin (u./ml.) in Milk						
	Total u.	u./lb.	lb./day*	1	1 1/4	2	Days:** 1/4	2 1/4	3	3 1/4	4
4420	2,222,000	2,000	35.5-36.2	0	0	0	0	0	0	0	..
4420	2,222,000	2,000	36.8-36.6	0	0	0	0	0	..	0	0
4111	3,120,000	2,000	26.0-22.2	0	0.014	0.010	0.009	0.011	0.008	0	0
4323	6,890,000	5,000	18.4-15.2	0	0.030	0.027	0.030	0.028	0.023	0.022	0.009
3629	7,110,000	5,000	47.6-45.3	0.010	0.018	0.019	0.015	0.019	0.022	0.019	0.015
4111	15,610,000†	10,000	29.7-21.4	0	0.022	0.032	0.026	0.022	0.018	0.018	0.014
3557	15,150,000†	10,000	36.8-37.5	0	0	0.016	0	0.014	0	0.010	0
3916	5,100,000 x 3‡	3,500 x 3	28.0-28.0	0.040	0.047	0.042	0.048	0.042	0.038	0.032	0.025
4111	5,100,000 x 3‡	3,500 x 3	41.0-41.0	0.083	0.076	0.060	0.071	0.056	0.058	0.049	0.042

*Measured 1 day and 8 days after the injection or, in the case of the three-dose schedule, 3 and 10 days after the third injection.

**Control milk specimens, taken before the injections, were negative.

TABLE 7—Intramuscular Benzathine Penicillin G plus Procaine Penicillin G in Aqueous Suspension (150,000 u. of Each/ml.)

Cow	Dose		Milk prod.		Penicillin (u./ml.) in Milk						
	Total u.	u./lb.	lb./day*	Days:** 1/4	1	1 1/4	2	2 1/4	3	3 1/4	4
4342	2,570,000	2,000	22.2-15.2	0.034	0.015	0.015	0	0	0	0	..
3649	3,582,000	2,000	53.0-51.2	0.028	0.026	0.013	0.015	0.012	0.013	0	0
4370	5,770,000	5,000	22.9-21.5	0.058	0.024	0.011	0.009	0	0.007	0	0
3557	7,580,000	5,000	32.3-39.9	0.059	0.028	0.022	0.009	0.008	0	0	0
3672	14,000,000	10,000	..-24.3	0.120	0.134	0.089	0.047	0.042	0.029	0.024	0
3834	14,690,000	10,000	51.8-50.3	0.051	0.059	0.062	0.024	0.020	0.018	0.022	0.007
3557	7,580,000 x 3‡	5,000 x 3	30.7-26.9	0.048	0.068	0.026	0.009	0.019	0	0.007	0
4342	8,960,000 x 3‡	5,000 x 3	54.4-53.6	0.089	0.119	0.068	0.049	0.044	0.022	0.015	0.014

*Measured 1 and 8 days after injection or, in the case of the 3-injection schedule, on the day of the second injection and 6 days after the third injection.

found in the milk 12 hours later but none was found 24 hours after the injection.⁵

Procaine Penicillin in Aqueous Suspension.—After a single dose of 2,000 units/lb., penicillin was detected in the milk for up to 48 hours (table 2). After 5,000 units/lb., the antibiotic was detected as long as 3 days in the milk, while after

10,000 units/lb., penicillin was detected in the milk of 1 cow for up to 78 hours. There appears to be little or no cumulative effect since, after 5,000 units/lb. for 3 days, penicillin was detected in the milk for only 54 hours.

With a dosage averaging 3,400 units/lb., penicillin has been found in the milk for

TABLE 5 (continued)—Intramuscular Procaine Penicillin G in Oil (300,000 u./ml.)

Penicillin (u./ml.) in Milk												
4 1/4	5	5 1/4	6	6 1/4	7	7 1/4	8	8 1/4	9	9 1/4	10	10 1/4
..
0.010	0.012	0.010	0.008	0.008	0.008	0	0	0	0	0	..	..
0.056	0.040	0.049	0.024	0.022	0.019	0.017	0.012	0.007	0	0	0	0
0.017	0.012	0.012	0.009	0.008	0	0	0	0	0	0	..	..
0	0	0	..	..	..	..	..	..	..	..	..	..
0.009	0.010	0.007	0	0.002	0	0	..	..	..	..	..	..

†Dose divided and administered at 2 injection sites.

‡Dose given on 3 successive days. Penicillin concentrations are for days after the third injection and are averages of assays on milk from 4 individual quarters.

TABLE 6 (continued)—Intramuscular Benzathine Penicillin G in Aqueous Suspension (300,000 u./ml.)

Penicillin (u./ml.) in milk													
4 1/4	5	5 1/4	6	6 1/4	7	7 1/4	8	8 1/4	9	9 1/4	10	10 1/4	11 11 1/4 12
..
0	..	..	..	..	..	..	..	..	..	..	..	..	..
0.007	0.004	0	0	0	0	..	..	..	..	..	..	..	..
0.018	0.014	0.014	0.014	0.012	0.010	0.013	0.008	0.007	0	0	0	..	..
0.018	0	0.014	0	0.010	0.008	0.012	0.007	0.012	0.009	0.007	0.013	0.011	0 0 0
0.010	0	0.008	0	0.009	0.008	0.008	0.018	0	0	0	..	..	..
0.022	0.018	0.012	0.004	0.005	0	0	..	..	..	..	..	..	..
0.032	0.024	0.022	0.009	0.007	0.004	0.002	0.001	0	..	..	..	..	..

†Dose divided and administered at 2 injection sites.

‡Dose given on 3 successive days. Penicillin concentrations are for days after the third injection and are averages of assays on milk from 4 individual quarters.

TABLE 7 (continued)—Intramuscular Benzathine Penicillin G plus Procaine Penicillin G in Aqueous Suspension (150,000 u. of Each/ml.)

Penicillin (u./ml.) in milk											
4 1/4	5	5 1/4	6	6 1/4	7	7 1/4	8	8 1/4	9	9 1/4	10-12 1/4
..
0	..	..	..	..	..	..	..	..	..	..	..
0	..	..	..	..	..	..	..	..	..	..	..
0	..	..	..	..	..	..	..	..	..	..	..
0.013	0	0	0	0	0	..	..	..	..	..	..
0.009	0	0	0	0	0	..	..	..	..	..	..
0.006	0	0.007	0	0	0	0	..	..	..	..	..
0.014	0.010	0.010	0.006	0.007	0.008	0.008	0.008	0	0.018	0.010	0

**Days after injection. Control milk specimens, taken before the injections were negative.

‡Dose given on 3 successive days. Penicillin concentrations are for days after third injection.

only 24 hours,⁶ but has been found to persist in the milk for 48 hours after injection of 5,000 units/lb.⁸ After an injection of 3,000 or 6,000 units/lb. of body weight, some cows have been found to yield penicillin-positive milk for 24 hours, whereas others did so for 48 hours.³

Procaine Penicillin G in Dihydrostreptomycin Solution.

—The maximum duration of penicillin in the milk was 48 hours after any of the doses of procaine penicillin G in dihydrostreptomycin solution (table 3). In only one instance was dihydrostreptomycin activity detected when penicillin was absent from the milk, and then it was 30 hours after the last of 3 daily injections

TABLE 8—Tetracycline in Milk After Intramuscular and Intravenous Administration

Cow	Dose			Milk prod. lb./day*	Days:** 1/4	Tetracycline (μg./ml.)						
	mg./lb.	Total mg.	ml.	Route		1	1 1/4	2	2 1/4	3	3 1/4	
3557	2	3,030	30.3	IM	29.7	0.87	0.48	0.33	0	0	0	0
3924	2	2,940	29.4	IM	43.1	1.20	0.53	0.35	0	0	0	0
3834	2	2,940	118	IV	43.2	2.37	0.75	0.82	0	0	0	0
3629	2	2,840	114	IV	47.2	3.89	1.15	0.66	0	0	0	0

*Measured 1 day after injection.

**Days after injection. Control milk specimens, taken just before the injection, were negative.

of 5,000 units/lb. The fact that the penicillin duration is somewhat shorter than after procaine penicillin aqueous suspension possibly may be attributed to the fact that a specified amount of penicillin is contained in a 50 per cent larger volume and that might contribute to a more rapid absorption from the site of injection.

Penicillin G Diethylaminoethylester Hydrodide Plus Dihydrostreptomycin.—After single intramuscular doses of 2,000, 5,000, or 10,000 units/lb., penicillin was not detected in milk beyond 48 hours. In only one instance did streptomycin persist in the milk as long as penicillin after administration of this product (table 4). Of interest are the comparatively high concentrations of penicillin in the milk observed 6 hours after treatment.

Procaine Penicillin G in Oil (PAM).—This product produced low concentrations in the milk after intramuscular injection, and doses of 5,000 or 10,000 units/lb. resulted in penicillin being detected in the milk for up to 7 or 8 days. In 1 cow given 5,000 units/lb. and 1 given 10,000 units/lb., no penicillin activity was detected in the milk at any time (table 5). It is speculated

that it must have been present but in quantities too small to be detected, i.e., less than 0.005 unit/ml. It is probably significant that these 2 cows were both producers of comparatively high daily yields of milk.

Penicillin has persisted in the milk for 5 days after an intramuscular injection of procaine penicillin G in oil (PAM) at a dose of 5,000 units/lb.⁸ Doses of 3,000 and 6,000 units/lb. have produced detectable concentrations of penicillin for up to 5 1/2 days in some cows and for only 1 1/2 or 2 days in others.³ It persisted in the milk of low-producing cows at higher concentrations for a longer period than in the milk of high-producing cows.³

Benzathine Penicillin G in Aqueous Suspension.—Intramuscular injection of this product resulted in extremely low concentrations of penicillin in the milk, but after a single dose of 5,000 or 10,000 units/lb., the antibiotic endured in the milk for 5 to 10 1/4 days. Three daily injections of 5,000 units/lb. produced somewhat higher concentrations than the single dose, but the duration was not prolonged further, since the antibiotic was detected for 6 1/4

TABLE 9—Tetracyclines in Milk After Oral Administration in Cows

Cow	Antibiotic	Daily dose*	Days treated	Milk prod. lb./day†	Days:** 1/4	Antibiotic (μg./ml.) in Milk						
						1	1 1/4	2	2 1/4	3	3 1/4	
3834	CTC	0.5 mg./lb.	5	41.5	0	0	0.05	0.06	0.12	0.03	0.10	
3629	CTC	0.5 mg./lb.	5	40.8	0	0	0.05	0	0.04	0	0	
3557	CTC	2.0 mg./lb.	5	26.8	0	0.07	0.21	0.13	0.26	0.06	0.15	
3924	CTC	2.0 mg./lb.	5	41.7	0	0.09	0.15	0.14	0.14	0.07	0.13	
4444	CTC	10.0 mg./lb.	3	26.2-13.4	0	0.28	0.41	0.85	1.04	0.38	0.63	
3834	CTC	10.0 mg./lb.	3	28.6-14.8	0	0.34	0.33	0.79	0.94	0.49	0.70	
4420	TC	10.0 mg./lb.	3	19.5-17.0	0	—	0	—	0.30	—	0.23	
3924	TC	10.0 mg./lb.	3	30.2-20.2	0	0	0	0.26	0.20	0	0	
3629	OTC	10.0 mg./lb.	3	25.1-19.4	0	0	0	0	0	0	0	
3649	OTC	10.0 mg./lb.	3	36.8-26.6	0	0	0	0	0	0	0	

CTC=chlortetracycline hydrochloride, TC=tetracycline hydrochloride, OTC=oxytetracycline hydrochloride.

*Administered orally in capsules in divided doses twice daily. With the 10 mg./lb. doses, cows did not eat all the capsules and, as a result, the effective doses were much lower in some cases. The actual daily doses (mg./lb.) ingested were: CTC, cow 4444—10.0, 9.5, and 7.7; cow 3834—10.0, 7.4, and 0. TC, cow 4420—

to 8 days after the third injection. One cow was given an injection of benzathine penicillin G in aqueous suspension, 2,000 units/lb., on 2 widely spaced occasions, and neither time was penicillin detected in the milk (table 6). As speculated above, it is felt that the antibiotic must have been present, but in quantities so small as to escape detection. Of interest are the instances where penicillin was not detected in the milk 6 hours after treatment, and one instance 24 hours after injection. The seeming appearance and disappearance of penicillin from the milk of cow 3557 after a dose of 10,000 units/lb. demonstrates the relationship between milk production and the sensitivity of the method. Since these cows were milked at 8 a.m. and 2 p.m., the morning yield of milk was considerably greater, resulting in a dilution of the antibiotic. In the case of cow 3557, the penicillin was barely detectable in the afternoon, but in the morning was probably just below the threshold of the sensitivity of the assay.

An average dose of 3,600 units/lb. has been administered to 5 cows. In 3 cases, no penicillin was detected in daily tests for 4 days, while in 2 cases, penicillin was detected only 24 hours after the treatment.⁶

Benzathine Penicillin G Plus Procaine Penicillin G in Aqueous Suspension.—As might be expected, this product produced results more or less intermediate between those of the individual components. The single doses, 2,000 and 5,000 units/lb., resulted in penicillin residues in the milk for up to 72 hours (table 7). Following the dose of 10,000 units/lb. penicillin was de-

tected for 102 hours. Surprisingly enough, there was considerable prolongation of the time during which penicillin was detected in the milk when a dose of 5,000 units/lb. was administered on 3 successive days. Penicillin was then detected from 5¼ to 9¼ days after the third injection. This was considerably at variance with the findings on the individual components or on other products in this study.

Tetracycline.—The results of the intramuscular and intravenous injection of tetracycline are given (table 8). Following a single dose of 2 mg./lb. the antibiotic was detected in the milk for 30 hours.

Results of Oral Administration

Buffered Potassium Penicillin Tablets.—Penicillin was never detected in the milk following the oral administration of penicillin. Milk samples were tested twice daily while penicillin was administered in a dosage of 1,000,000 units daily for 10 days, and 2,500,000 units twice daily for 5 days. These negative results are considerably at variance with the findings of others¹⁰ that daily doses of approximately 170,000 and 270,000 units of procaine penicillin in a feed concentrate resulted in concentrations of 0.05 to 0.15 unit/ml. in the milk.

Bacitracin.—Bacitracin activity was not detected in the milk during 10 days while a daily dose of 0.5 Gm. (21,000 units) was administered orally.

Streptomycin.—Streptomycin activity was not detected in the milk while a dose of

TABLE 9 (continued)—Tetracyclines in Milk After Oral Administration in Cows

Antibiotic (μg./ml) in milk											
4	4¼	5	5¼	6	6¼	7	7¼	8	8¼	9	9¼-10¼
0	0.14	0.10	0.18	..	0.13	0.04	0	..	0	0	..
0	0.03	0	0	0	0	0	..	..	..	..	..
0.08	0.23	0.16	0.31	0.17	0.14	0.07	0	..	0	0	..
0.04	0.13	0.08	0.19	0.08	0.07	0	0	..	0	0	..
0.11	0.23	0.12	0.07	0	0	0	0	0	0	0	0
0.13	0.43	0.24	0.22	0.13	0.10	0.09	0.06	0	0.06	0	0
..	0	..	0	..	0	..	..	..	..	..	..
0	0	..	..	..	..	..	..	..	..	..	..
0	0	..	..	..	..	..	..	..	..	..	..
0	0	..	..	..	..	..	..	..	..	..	..

10.0, 9.0, and 2.0; cow 3924—10.0, 8.8, and 8.7. OTC, cow 3629—5.0, 2.1, and 0.5; cow 3649—2.6, 4.7, and 2.9.

†Measured 1 day, and in some cases 3 days, after the initial dose.

**Days after injection control milk specimens, taken before treatment, were negative.

0.5 Gm. was given orally twice daily for 5 days, nor for 2 days after the course was completed.

The Tetracyclines.—The tetracyclines were given orally by placing capsules in the feed. Little difficulty was encountered in giving chlortetracycline in doses of 0.5 and 2.0 mg./lb. daily for 5 days. Small amounts of the antibiotic appeared in the milk a day or 2 after treatment started and were detected in the milk for up to 2¾ days after treatment stopped (table 9). At the 10 mg./lb. dose level, the cows ate less as the study progressed, consequently they consumed less antibiotic, and milk production was considerably diminished. In spite of these difficulties, chlortetracycline was detected in considerable quantities in the milk during treatment, and it persisted in the milk for 3 to 7 days after cessation of treatment. Tetracycline was detected in small quantities in the milk only during the third day of treatment, and in 1 cow one day after treatment was stopped; otherwise no tetracycline activity was detected in the milk.

Oxytetracycline activity was not detected in the milk, but this may reflect somewhat the very poor consumption of this antibiotic by the cows. It should also be stressed that the assay method employed is about 5 times more sensitive to chlortetracycline than to tetracycline and oxytetracycline. It is, therefore, possible that our failure to detect the latter antibiotics in milk with any consistency was due to the inability of the method to detect them in low concentrations.

Discussion

Part of these data were useful in establishing a reasonable withholding period for antibiotics used parenterally in the systemic treatment of infections in lactating dairy animals. On April 12, 1960, it was proposed¹ to amend the Antibiotic Regulations to require the labeling to bear either of the following statements: "Warning: Not for use in dairy animals since this use will result in contamination of the milk with the antibiotic." or "Warning: Milk taken from treated dairy animals within _____ hours after the latest injection must not be used for human consumption." The blank would be filled in with a figure not greater than 96, which figure shall be authorized based on data which is considered

adequate to prove when the milk from treated animals will contain no residues of the antibiotic. A 96-hour withholding time was judged to be a practical limit. If products were allowed which required longer withholding times than 96 hours, it would work unnecessary hardship on dairy farmers and might engender frequent disregard for the proper withholding time.

On the basis of the data presented in this paper, it is felt that the following intramuscular products can be used with a 96-hour withholding time: crystalline sodium or potassium penicillin G in aqueous solution, procaine penicillin G in aqueous suspension, procaine penicillin G in dihydrostreptomycin solution, penicillin G diethylaminoethylester hydriodide plus dihydrostreptomycin, and tetracycline hydrochloride (intravenous as well).

The following products cause penicillin residues in milk for periods exceeding 96 hours after intramuscular injection and should therefore not be used in treating lactating dairy animals: procaine penicillin G in oil with aluminum monostearate (PAM), benzathine penicillin G in aqueous suspension, and the mixture of benzathine penicillin G and procaine penicillin G in aqueous suspension.

Animal feeds containing the tetracyclines in amounts which will provide in the neighborhood of 0.5 mg./lb. of body weight per day, or greater concentrations, are not recommended for dairy animals.

Summary

A number of penicillin preparations were administered intramuscularly to cows in single doses of 2,000, 5,000, and 10,000 units/lb. of body weight, as well as 5,000 units/lb. on 3 successive days. Milk samples were assayed for antibiotic content. Injection of potassium penicillin G in aqueous solution resulted in penicillin being found in the milk for up to 30 hours after treatment. Procaine penicillin G in aqueous suspension produced residues in the milk for up to 78 hours and, when given in conjunction with dihydrostreptomycin, residues were detected in milk for only 54 hours. Penicillin G diethylaminoethylester hydriodide plus dihydrostreptomycin caused detectable amounts of antibiotic to be present in milk for 48 hours. Tetracycline was detected in the milk for up to 30 hours

when given intramuscularly or intravenously at a dosage of 2 mg./lb. The products just mentioned should be satisfactory to use in lactating dairy animals if the milk is discarded for 96 hours.

Procaine penicillin G in oil with aluminum monostearate, and benzathine penicillin G in aqueous suspension, both alone and in combination with procaine penicillin G, caused penicillin residues in milk for maximal times $8\frac{1}{4}$, $10\frac{1}{4}$, and $9\frac{1}{4}$ days, respectively, after intramuscular injection. They should, therefore, not be used in lactating dairy animals. The practice of discarding milk for such long periods is not believed to be practical. No antibiotic residues were detected in milk after the oral administration of penicillin (up to 5 million units daily), bacitracin (0.5 Gm. daily), and streptomycin (1.0 Gm. daily). Chlortetracycline produced significant residues in milk when oral doses of 0.5 to 10.0 mg./lb. were given daily. Tetracycline (10.0 mg./lb.) produced minimal residues in milk, and oxytetracycline did not produce any detectable residues in milk when doses which varied daily from 0.5 to 5.0 mg./lb. were given orally, but the assay method was only about one fifth as sensitive to tetracycline and oxytetracycline as it was to chlortetracycline.

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Leptospiral Infections in Feral Rodents

Between October, 1953, and July, 1955, 2,673 rodents representing 10 species were collected from 28 habitats in southwestern Georgia, and 933 were tested for leptospirae by culturing kidney tissue. *Leptospira ballum* was the only serotype isolated and was cultured from 22 per cent of the house mice, 0.8 per cent of the oldfield mice, and 1.9 per cent of the cotton rats. Positive specimens, regardless of species, were collected almost exclusively from habitats supporting large house mice populations. Infection rates in house mice ranged between 30 and 35 per cent in most habitats ecologically suited to sizable house mice populations.—*Am. J. Pub. Health and Nation's Health*, 50, (May, 1960): 682.

Captive Dolphins and Seals

David H. BROWN
Rankin W. McINTYRE, D.V.M.
C. A. DELLI QUADRI, D.V.M.
Robert J. SCHROEDER, D.V.M.

IN THE FIRST 5 years of operation (1954-1959), the oceanarium, Marineland of the Pacific, Marineland, Calif., has successfully maintained in captivity several species of cetaceans (dolphins and pilot whales) and pinnipeds (seals). Prior to 1959, mortality was comparatively low.

Many dolphins initially collected died of complications arising from injuries inflicted during capture.² After the development in 1954 of a more humane method of collection, there was a considerable reduction in mortality.

The losses occurring during the years 1955 to 1958 were, with few exceptions, caused by animals swallowing indigestible foreign material (fig. 1) and resulting gastric or enteric impactions.

Harbor seals and sea lions are extremely hardy and do well in captivity if adequately housed and fed. Before 1959, mortality in the seal exhibit had been confined to newly arrived, unweaned seals, injured seals found stranded on the shore, and to 1 old male sea lion that died of senility after 25 years in captivity.

In 1959, mortality was particularly high. In all, 10 animals were involved. By necropsy, these losses were found to be caused by parasitism, bacterial infection, injury, or gastric impaction.

The following is a clinical history of these animals, together with the results of pathologic investigation.

From Marineland of the Pacific, Marineland, Calif., and County of Los Angeles Livestock Department, Los Angeles, Calif. Mr. David Brown is Curator of Mammals, Marineland of the Pacific. Drs. McIntyre, Delli Quadri, and Schroeder are members of the Los Angeles County Livestock Department.

Contribution No. 14, Marineland of the Pacific Biological Laboratory.

Harbor Seal

At the beginning of 1959, Marineland owned 5 harbor seals, *Phoca vitulina geronimensis* (Allen). The exhibit had few maintenance problems and, apart from individual seals that contract minor respiratory infections, health problems of a serious or unusual nature were unknown.

In November, 1958, 3 seals experienced discomfort from pediculosis caused by the marine louse, *Echinophthirius horridus* (Olfers).⁵ In an attempt to alleviate the condition, the pool water was liberally treated with both copper sulfate and chloride of lime for 4 days. This temporarily appeared to control the infestation.

On Jan. 27, 1959, lice were present on all 5 seals. They were removed from their pool and sprayed with 0.88 per cent malathion. They were not washed for several hours. This treatment proved effective and was repeated 10 days later.

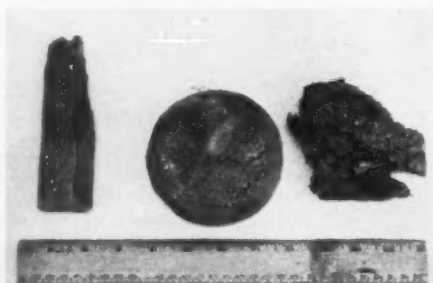


Fig. 1—Foreign bodies recovered from the first stomach chamber of a female striped dolphin (*Lagenorhynchus obliquidens*) that died at Marineland, Calif. Left to right—a wedge-shaped piece of wood 5 inches long, a solid rubber ball 4 inches in diameter, and a piece of cellulose sponge.

During the ensuing weeks, 4 harbor seals had signs of acute respiratory distress. Coughing, nasal discharge, and moderate dyspnea were observed (fig. 2). These seals were treated with broad-spectrum antibiotics and supplementary vitamins. When antibiotic therapy was discontinued, after several days, they relapsed and again had the same signs.

On April 19, 1959, a harbor seal died and was forwarded to the laboratory of the Los Angeles County Livestock Department. At necropsy, a heavy infection with nematodes was found in the right side of the heart (fig. 3) and branches of the pulmonary artery. The nematodes were identified as filarids of unknown species.*

A diffuse pneumonitis was associated with the parasitism. Caseous exudate was scattered throughout the lumen of the bronchial tree.

*Specimens were submitted to Drs. Donald Heyneman and Angela Taylor, parasitologists at the University of California at Los Angeles. Currently, studies of the life cycle and generic and species classification of this parasite are being conducted.



Fig. 2—A harbor seal (*Phoca vitulina geronimensis*) with heavy nasal exudation associated with chronic respiratory dyspnea.

Since satisfactory treatment methods were not available, the 4 remaining harbor seals were euthanatized. For this purpose, intraperitoneal injections of pentobarbital sodium were used. On examination, each was found to be infected with nematodes and had pathologic changes similar to those described above.

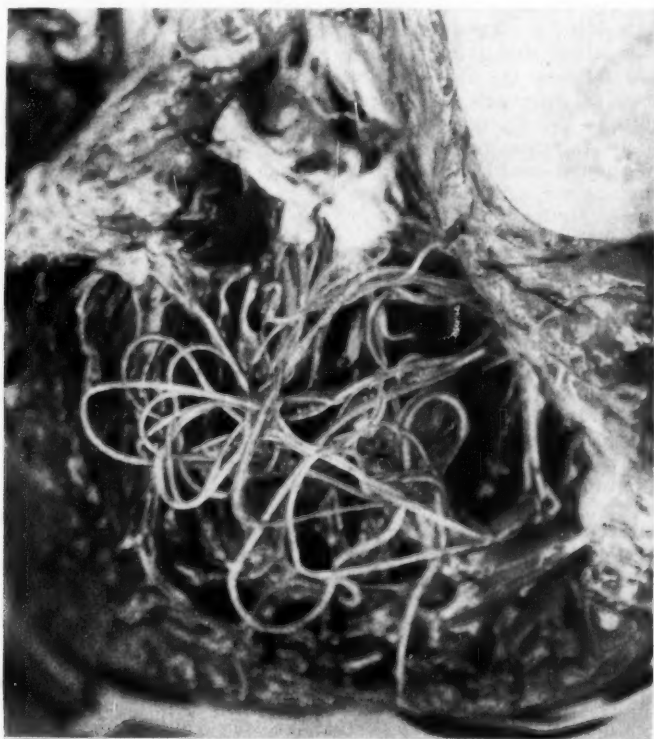


Fig. 3—Nematodes in right side of heart of the harbor seal.

Pacific Bottle-Nosed Dolphin

In February, 1958, a male Pacific bottle-nosed dolphin, *Tursiops gilli* (Dall), newly arrived at Marineland, rejected nourishment until the fourteenth day of captivity.

At this time, cachexia was pronounced and signs of tonic spasms were observed, together with a lateral spinal curvature. The dolphin could not swim and floated on the surface in its tank. This inactivity resulted in a severe sunburn around the blowhole and the dorsal fin.

On commencing to feed, its condition rapidly improved under the oral and intramuscular administration of multiple vitamins. The sunburn was alleviated by applying a compound of zinc oxide ointment and petroleum jelly directly to the areas affected. After recovery the dolphin was transferred to one of the large community tanks, where it learned several tricks, and was used in the trained dolphin display.

In January, 1959, the dolphin gradually began to lose appetite. This culminated in complete inappetence on the morning of February 1. Later that day, it regurgitated a quantity of gravel and rock particles. Suspecting a gastric impaction, mineral oil was administered by stomach tube. This was followed the next day with vitamin B complex injections to induce appetite. In spite of these procedures, the dolphin continued to refuse food and the following day was found dead in its tank. Other than an obvious cachexia, the cause of death was not determined.

Atlantic Bottle-Nosed Dolphin

Case 1.—This female Atlantic bottle-nosed dolphin, *Tursiops truncatus* (Montagu), was 1 of 4 acquired from Marine Studios, St. Augustine, Fla., in September, 1954. From the first, the dolphin lacked the physical robustness of the others. Although she had a normal appetite, she was emaciated in appearance throughout her captivity.

On May 18, 1959, she refused food and did not eat for 4 days. Under the stimulation of vitamin therapy, the dolphin resumed feeding and continued to eat under therapeutic stimuli for several weeks. On June 20, 1959, she had a pronounced appetite loss and rapidly lost weight. Vitamin therapy no longer appeared to encourage her appetite and by July 7, 1959, she be-

came so weak that she had difficulty remaining at the surface of the water to breathe.

The dolphin was euthanatized the following day and a necropsy was performed. On pathologic examination, cirrhosis of the liver and jaundice were found. The liver surface was nearly smooth; however, the cut surface was cirrhotic. Trematode flukes were found and identified as *Zalophotrema hepaticum*. This fluke has been reported only in marine mammals, usually restricted to the bile ducts of the liver. This fluke has been found in the California sea lion^{7,12} and in seals of unlisted species.⁸ The exact life cycle of *Zalophotrema* is not known. Some workers have suggested that certain marine mollusks and fish are involved as intermediate hosts.

Histopathologic examination confirmed gross findings. There was a moderately advanced biliary cirrhosis; fibrosis was limited to an encirclement of bile duct; only mature fibroblasts were seen. There was no evident perilobar or portal fibrosis. Bile pigments were diffusely scattered throughout, and certain degenerative or inflammatory changes including fatty degeneration and cloudy swelling were observed. No significant lesions were found in other tissues examined. No bacterial pathogens were isolated from the spleen, liver, or intestines.

The history of this dolphin suggests a trematode infection of long standing.

Case 2.—This small 2-year-old male was 1 of the 6 dolphins flown from Florida in January, 1959.

The first signs of sickness became apparent on Aug. 27, 1959. On this day the dolphin ate only half its normal daily food allowance. By the following day his condition had worsened and he ate only 1 fish.

In the final 3 days, the dolphin could not be induced to take food. He became weak and recumbent and, despite the use of antibiotics for 5 days, died on the sixth day of illness.

At necropsy, some degenerative changes were found in the liver. There were no other gross lesions of significance. On histologic examination, fatty degeneration and cloudy swelling were seen in the liver and kidneys. Other acute changes in the kidneys were congestion, proliferation of epithelium and endothelium in glomerular tufts, some white cell infiltrations into interstitial tissues, and varying degrees of necrosis of tubular epithelium.

Salmonella typhimurium was cultured from the spleen and small intestines.

In an attempt to discover a source of *Salmonella* infection and a possible carrier, a series of fecal samples were secured from both the seals and dolphins held in the sea arena. Sampling was conducted twice in 6 weeks. No enteric pathogens were recovered.

Striped Dolphin

Case 1.—This female striped dolphin, *Lagenorhynchus obliquidens* (Gill), was one of the original animals introduced into the exhibit. She was harpooned in September, 1954; after recovering from the injury, she lived for almost 5 years in the circular tank.

Abnormal behavior was first noticed on June 14, 1959, when she commenced, sporadically, to lose appetite and then resume near normal feeding after she was given mineral oil and vitamins. On July 11, 1959, she stopped feeding again and during the following week consumed only a fraction of her normal daily food requirements. She refused nourishment on July 20, 21, and 22, and ate only 1 fish on July 23.

The dolphin was found dead in the tank on July 25, 1959. Subsequent examination showed that she had died of starvation resulting from massive gastric impaction. Seven cotton gloves were recovered from the first and second stomach compartments. These had completely blocked the stomach from the pylorus to esophageal opening.

Marineland divers use cloth gloves to protect their hands while conducting diving operations in the large tanks, then dry them over a rail by the tank. It was evident what had occurred.

The ingestion of foreign objects by captive cetaceans has caused several fatalities both at Marineland and Marine Studios, Florida. If the ingestion of such objects is seen, emesis can usually be induced by the administration of large quantities of mineral oil. The use of apomorphine by several veterinarians has consistently failed as an emetic. Apomorphine has been tried in varying dosages on several dolphins and a pilot whale without success.

We have observed that some captive cetaceans tend to develop a depraved appetite and eat paper, rocks, and other foreign debris that may accidentally fall into the tanks. The Marineland staff has to be continually alert to this danger and makes

every effort to keep such material out of the tanks.

Case 2.—This female striped dolphin lived in the circular tank at Marineland for 2½ years. Abnormal behavior was first observed on Nov. 9, 1959, at which time the dolphin lacked zest in the performance of its trained behaviors. There was a pronounced jaundice of the palate. During the ensuing 10 days, she refused to perform but continued to eat her daily allowance of food into which were inserted capsules containing broad-spectrum antibiotics.

On November 20 and 21, a pronounced loss of appetite was recorded and, suspecting a gastric impaction, the tank was netted and the dolphin caught and transferred to a small water enclosure. Mineral oil was administered by stomach tube. Vomition followed, but no foreign bodies were found.

The dolphin continued to eat in a limited manner until November 25. After this, she refused food and died on November 26.

Examination showed death to be the result of purulent pneumonia and septicemia. A large abscess about 4 inches in diameter, accompanied by multiple small abscesses, was found in the right lung and pleura. Other findings included degenerative changes in the liver, hyperemia of the intestinal and stomach mucosae, multiple abscesses in the cortex of the right kidney, and peritonitis. Coagulase-positive staphylococci were recovered from the abscesses and spleen.

There was an abscess on the right side and edema of the musculature in the right thoracic wall, lateral to the scapula and adjacent to the large lung abscess. This suggested an injury as the underlying etiologic factor. Our records included a report of an unidentified dolphin leaping from the water and falling on a training platform during the late summer. The diver who was witness to this stated that the dolphin struck the platform with considerable force, stranding itself momentarily before re-entering the water. At the same time of the year, a striped dolphin, believed to be the one in question, upon leaping over a hurdle during a performance collided with a pilot whale as it surfaced to breathe. The impact suffered in either mishap could have resulted in the trauma described.

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Rous Sarcoma in Poultry Transmitted by Contact

Rous sarcoma, a virus-caused poultry cancer previously thought to be noncontagious, has been proved transmissible by direct contact between birds in experiments by Dr. B. R. Burmester of the ARS Regional Poultry Laboratory in East Lansing, Mich.

These studies with poultry establish more firmly the belief held by many scientists that viruses cause some forms of animal and human cancers.

In the experiments at East Lansing, the virus of Rous sarcoma was transmitted to healthy chickens when they were raised in direct contact with birds inoculated with the virus. Tumors that developed in the birds infected by contact were microscopically and pathologically similar to tumors in inoculated birds.

Tumors occurred in 80 per cent of the chickens when the virus was applied to skin that had been scratched with a hypodermic needle or to an area where immature feathers had been extracted. Intranasal instillation of the virus caused tumors in more than half the birds.

However, no tumors resulted when virus was placed under the tongues of chickens or applied to a nonfeathered area of intact skin or when chickens were confined to a small enclosure and made to breathe a high virus dose in aerosol form for 5 minutes every day for 5 days.—*USDA Release, July 28, 1960.*

Physalopterid Infections in the Capybara

ON NOV. 10, 1959, in the Lincoln Park Zoological Gardens, 408 specimens of the physalopterid *Abbreviata africana* (fig. 1) were found in the stomach of a male capybara (*Hydrochoerus hydrochoerus*) that had died earlier that day.

The feces of the only other capybara, a female, was examined daily, Dec. 5-14, 1959, for nematode eggs, by sugar flotation methods. Although no eggs were found, she was given 1,350 mg. of piperazine adipate mixed with her feed each day. No worms were passed and her general condition seemed improved. On Dec. 22, 1959, the female died. At necropsy, 42 specimens of *A. africana* were found in her stomach.

The cause of death was listed as undetermined in both cases.

The 2 capybaras were received at the zoo in July, 1957, and were about 3 months old at that time.

Abbreviata africana was originally discovered in the gray-footed squirrel (*Paraxerus cepapi*) in 1923.¹ When the nematode genus *Abbreviata* was reviewed,² no species from the capybara were listed. This is believed to be the first record of a physalopterid parasite from *Hydrochoerus* in the western hemisphere.—Benedict J. Jaskoski, Ph.D., associate professor, Department of Biological Sciences, Loyola University, Chicago, Ill.



Fig. 1.—Male and female specimens of *Abbreviata africana* from the stomach of the capybara (rule calibrated in centimeters).

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The author thanks Mrs. M. B. Chitwood, USDA, ARS, Beltsville, Md., for identification and information about the parasites.

This investigation was supported in part by a grant-in-aid from the Society of the Sigma Xi.

The Capybara, Largest of Rodents

The capybara, largest of all living rodents, has an IQ equal to that of the pig and second only to apes and man. From his squared-off muzzle to his button-sized tail, he measures up to 4 ft. and weighs as much as 220 lb. Despite the foreboding exterior of coarse, hoglike bristles, the capybara is the most mild-mannered and gentle of all animals. He usually lives near the water and spends his time grazing, browsing, or sitting thoughtfully on the bank of a river. In captivity, he quickly adapts himself to the ways of the household, and one has even been reported acting as a reliable "seeing-eye" for his blind master.—*Living Mammals of the World*, Hanover House, Garden City, N. Y.



—New York Zoological Society Photo

This capybara lives in New York's Zoological Park.

Calcified Lumbar Intervertebral Disk

in a Dachshund—A Case Report

Frank A. RAMSEY, D.V.M.

ON AUG. 10, 1959, a female Dachshund, 5½ years old, was admitted for examination with a history of increasing incoordination of the hindlegs during the past 3 days. The dog was nervous and obese (32 lb.); no physical abnormalities were visible. Its temperature was 102.2 F. The colon was found to be enlarged upon palpation. A tentative diagnosis of acute constipation was made after learning from the owner that no feces had passed for several days, and the dog had not been injured. The gait was incoordinated and the dog's hindquarters weaved from side to side; occasionally her hindlegs would collapse.

Diagnosis

The administration of a mineral oil laxative and resulting emptying of the colon failed to alter the posterior incoordination. On the second day after admission, the dog was able to stand on her hindlegs only when given assistance, and she fell when support was removed. Pedal and cutaneous reflexes were still present in the hindlimbs. The tentative diagnosis was changed to posterior paralysis and a radiograph was taken. Calcification of the intervertebral disk between lumbar vertebrae 6 and 7 was visible (fig. 1). On the third day after admission, the dog had complete paraplegia posterior to lumbar vertebra 6 (fig. 2). Voluntary control of the bladder and colon were lost on this day. Pedal and cutaneous reflexes were absent in the hindquarters. Her temperature was normal and her appetite was excellent.

Treatment

For the next 52 days, paraplegia remained complete and unchanged. The colon

and bladder were expressed manually several times daily during this time. Intermittent urinary tract infections were controlled with a urinary antiseptic and antispasmodic* primarily and antibiotics if the infection did not abate promptly. Steroid therapy** at recommended dosages during this time produced no improvement. The diet was changed to a special formulation† with a vitamin-mineral powder‡ and a liquid vitamin tonic§ was added in an effort to reduce the dog's weight and decrease urinary system complications. The dog's weight was reduced from 32 to 18 lb. in 6 months. Its appetite remained excellent during this time and its temperature varied from normal only during the quickly controlled urinary tract infections. The hindquarters were manipulated and massaged daily to minimize disuse atrophy, and necessary care was taken to prevent urine scald and pressure sores. Talc was used daily on the skin, and antibacterial powders*** were used to control occasional skin lesions. It was decided that the only recourse lay in surgery.

Surgical Procedure

Preparation for surgery was begun on Oct. 1, 1959, by placing the dog on a liquid diet. On October 3, a tranquilizer|| was given intravenously to calm the dog and reduce the anesthetic dosage. The anesthetic# was given intravenously, and the dog was prepared for a ventral midline incision.

*Unised, Chicago Pharmacal Co., Chicago, Ill.

**Meticorten, Schering Corp., Bloomfield, N. J., and Cortaba, Upjohn Co., Kalamazoo, Mich.

†K/D Prescription Diet, Hill Packing Co., Topeka, Kan.

‡Petonic, Upjohn Co., Kalamazoo, Mich.

§VAL, Fort Dodge Laboratories, Fort Dodge, Iowa.

***Suloptin, Pitman-Moore Co., Indianapolis, Ind.; Furacin, Eaton Laboratories, Inc., Norwich, N. Y.

||Thorazine, Pitman-Moore Co., Indianapolis, Ind.

#Nembutal, Abbott Laboratories, North Chicago, Ill.

Dr. Ramsey is a Captain, V.C., U. S. Army, Fort Leonard Wood, Mo.



Fig. 1—Calcification of intervertebral disk between lumbar vertebrae 6 and 7 is visible in this radiograph of the lumbar region of a dog. The radiograph was taken Aug. 12, 1959.

An incision 4 inches long was made through the skin and underlying tissues, and the abdominal cavity was entered. Blunt dissection and retraction exposed the bodies of lumbar vertebrae 6 and 7 and the intervertebral disk. An incision 14 mm. long was made along the longitudinal axis of the vertebral column through the ventral longitudinal ligament over the intervertebral disk between L. 6 and 7. An incision approximately 7 mm. long was made transversely through the annulus fibrosus of the intervertebral disk. A round-faced dental scaler modified by straightening the shaft of the head was inserted through this incision into the nucleus pulposus of the disk.

The calcium deposit could be felt as a gravel-like substance, similar to that encountered in cutting a tuberculosis calculi. About 4 mm. of calcium was scraped out of the nucleus pulposus of the disk. Scraping was discontinued when no more calcium could be removed or felt by probing. No closure was made of the disk or ventral longitudinal ligament. Normal closure of the ventral midline incision was accomplished.

Postoperative Care

Sutures were removed 10 days after surgery following first-intention healing. The

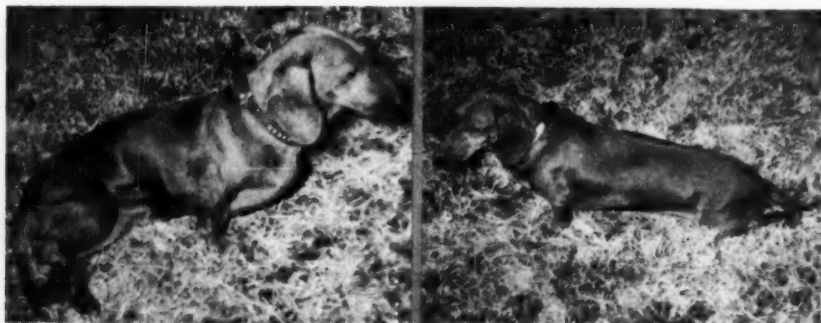


Fig. 2—Pictures, taken Aug. 10, 1959, of female Dachshund with paraplegia. Notice how the dog dragged her hindlegs when she attempted to walk.



Fig. 4—Pictures, taken on Jan. 19, 1960, of the Dachshund shown in figure 2. At this time the dog could walk.

colon and bladder were expressed manually every day and the hindquarters were massaged. The dressing was changed whenever it became soiled and was discontinued after 10 days. The body temperature remained normal and the appetite was excellent.

Recovery Period

Twenty days after surgery, the dog moved her tail slightly; 29 days after surgery, pedal and cutaneous reflexes returned. After this time the dog was placed in a supporting belly-sling every day for several hours. Two months after surgery, the dog could stand unaided; however, her hindlegs had a tendency to cross and would collapse to the rear whenever she moved forward. The dog gained voluntary control of the bladder and colon about 45 days after surgery, although control was lost when she was asleep. Ninety days after surgery, the dog was ambulatory with complete control of bladder and colon (fig. 4). It was believed that daily use of a galvanic current machine during the entire paralytic period

might have maintained muscle tone in the hindquarters and greatly speeded the recovery time. Unfortunately, a machine was not available.

Discussion

On Jan. 19, 1960, almost 4 months after surgery, several radiographs were made of the area of the seventh lumbar vertebra. In these radiographs, almost complete calcification of the intervertebral disk between lumbar vertebrae 6 and 7 could be seen (fig. 3). This raised a question as to whether the operation or merely time had led to recovery.

Considering the fact that paraplegia was complete up to the time of surgery and that recovery began 20 days after surgery, one might surmise that the removal of the primary calcification relieved the pressure on the spinal cord. The subsequent secondary calcification of the disk did not cause protrusion of the intervertebral disk into the spinal canal and therefore did not interfere with recovery of the dog.

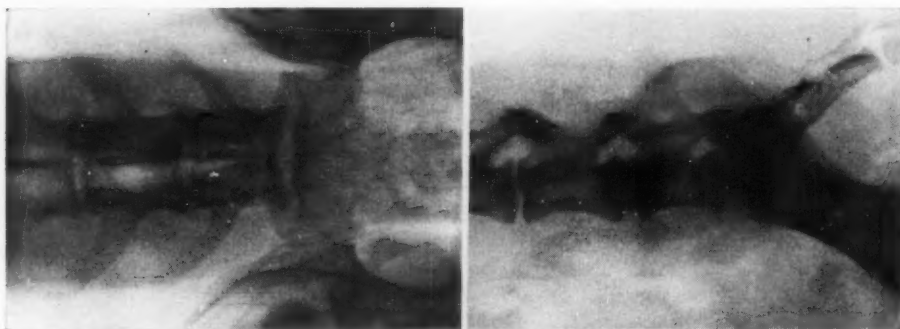


Fig. 3—Radiographs, taken Jan. 19, 1960, of lumbar region of a dog. Calcification of intervertebral disk is visible between lumbar vertebrae 6 and 7.

Summary

A female Dachshund, 5½ years old, was paralyzed for 71 days because of calcification of the nucleus pulposus of a lumbar intervertebral disk causing protrusion of the disk and pressure on the spinal cord. Diagnosis was made by clinical signs and confirmed by radiography. The calcium deposit was surgically removed and the dog began to recover 20 days after surgery and 71 days after the onset of paralysis. Three months passed between the first noticeable return of innervation to the tail and that time when the dog was ambulatory with complete control of bladder and colon.

In radiographs taken 5½ months after the onset of paralysis and 3½ months after

surgery, an almost complete calcification of the intervertebral disk is visible. This poses a question as to whether time or the surgery effected the recovery. If surgery was responsible for the recovery, this dog was saved from paraplegia (which dictated euthanasia) by a simple surgical procedure which should be attempted on animals similarly affected before euthanasia is recommended. Daily care was extensive; however, an interested owner can be taught to perform much of this routine care.

When observed on Sept. 17, 1960, the Dachshund was in excellent condition, weighed 23 lb., and had normal control of her body.

Susceptibility of Mice to Foot-and-Mouth Disease Virus

In an experiment to determine if lactating mice inoculated with foot-and-mouth disease virus (FMDV) transmitted infection to nursing offspring, approximately one half of the lactating female mice died following intraperitoneal inoculation with virus produced in tissue cultures. Since this indicated a decrease in the natural resistance of adult mice that was apparently associated with the physiology of the lactating female, experiments were conducted to investigate this observation. The preliminary experiments were designed to verify the observation that lactating mice were susceptible to FMDV, whereas the final experiments were designed to study factors which might affect the susceptibility of these mice.

The experiments revealed that certain pregnant mice and lactating mice nursing young were susceptible to FMDV produced in cultures of bovine kidney cells. Removal of the young one or two days before inoculation resulted in a decrease in the susceptibility of the lactating mice. Regardless of the amount of virus inoculated, a maximum of about 40 to 70 per cent of the lactating mice were susceptible, whereas others developed no sign of infection.—Charles H. Campbell in *J. Immunol.*, 84, (May 5, 1960): 469.

Thallium Intoxication in Dogs

George W. MATHER, D.V.M., PH.D.
Donald G. LOW, D.V.M., PH.D.

THE PURPOSE of this report is to present clinical and laboratory findings on thallium intoxication of 6 dogs accidentally poisoned, and the results of treatment of affected dogs with diphenylthiocarbazon.

There are many reports on thallium toxicity, but only a few pertain to dogs and cats treated by veterinarians. One investigator reported on this poisoning in 13 dogs; each of several others^{5,6,8,10} reported it in 1 dog each. In all these reports, ingestion of thallium was fatal to the dogs. All of these authors described essentially identical clinical signs which coincide well, with minor exception, with those in the dogs we observed.

Diphenylthiocarbazon (70 mg./kg. of body weight) was given three times a day to all dogs, except the second, in this series, as a specific treatment for thallium poisoning. Since the optimal dosage had not been established for dogs, we used that derived from experimental work on rats. In 1 dog, there appeared to be some exacerbation of signs when the dosage was temporarily reduced by approximately 50 per cent. Supportive therapy consisted of parenteral fluids (isotonic sodium chloride solution, 5% dextrose in saline solution, Fox* solution) given subcutaneously, injectable vitamin B complex, penicillin, streptomycin and, in one instance, tetracycline. Protective ointments were applied to the skin lesions.

Results of laboratory analyses performed on specimens from the dogs included in this report appear in the discussion.

From the Division of Veterinary Medicine and Clinics, College of Veterinary Medicine, University of Minnesota, St. Paul.

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Fox solution — sodium acetate ($\text{Na}_2\text{H}_3\text{O}_2 \cdot 3\text{H}_2\text{O}$), 5.0 Gm.; sodium chloride, 5.5 Gm.; calcium chloride, 0.3 Gm.; magnesium chloride ($\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$), 0.3 Gm.; potassium acetate, 1.0 Gm.; sodium citrate ($\text{Na}_3\text{C}_6\text{O}_7 \cdot 2\text{H}_2\text{O}$), 0.8 Gm.; distilled water of sodium, 1000 ml.

Clinical Findings

Case 1 (SE 2582).—A 22-lb., spayed female Dachshund, 3 years old, was first examined on Nov. 27, 1956, 10 days after illness was observed. The owner described lameness in the forelimbs, followed in a few days by persistent emesis and, more recently, reddening of the skin of the thorax, axillae, inner folds of the ears, and the lips. The dog was totally inappetent. She had been treated for arthritis and gastroenteritis. Exterminators had been recently employed to control rodents at the home.

When submitted, the dog was moderately depressed; its temperature, pulse, and respiration were within accepted normal limits. The most striking lesion was erythema of the skin over the thorax, the axillae, the inner aspects of the pinnae, the lips, and the digits adjacent to the foot pads. The visible mucous membranes were mahogany colored. A tentative diagnosis of thallium poisoning was made. On examination, using the method of Hammond,³ heavy metal was found in the urine.

The dog gradually recovered during the 8 days it was hospitalized. It was given diphenylthiocarbazon for 6 days. While it was hospitalized, the areas of the epidermis which were severely hyperemic became necrotic and sloughed, while the less inflamed areas remained intact. The dog ate after 4 days in the hospital; she continued to improve and made an uncomplicated recovery.

Case 2 (SE 2646).—A male German Short-Haired Pointer, 2 years old, was examined for the first time on Dec. 26, 1957, because of a skin laceration. A secondary complaint was an erratic appetite, occasional emesis, and diarrhea. Paper and other foreign matter had been observed in the vomitus. Gas and fluid could be palpated in the dog's intestines. A mild conjunctivitis was present. No other abnor-

malities were observed. Tablets containing cerium oxalate and benzocaine were dispensed for home administration. The owner was instructed to feed liquid or soft foods and to return the dog if he did not improve.

Two days later, the dog was returned because he was not eating, had vomited twice, and was urinating more frequently than normal. His temperature was 100 F. On examination, a possible abnormal mass suggesting a foreign body was found in the abdomen. A laparotomy seemed justified

nosis was not made sufficiently early to allow specific treatment.

Case 3 (SF 1777).—A male Beagle, 14 months old, had been ill for 3 weeks and under the care of a veterinarian who had diagnosed thallium poisoning. When treatment with iodides was not successful, the dog was referred to the University of Minnesota veterinary clinic for confirmation of the diagnosis and diphenylthiocarbazon therapy.

When submitted, the dog was listless,

TABLE 1—Results of Initial Hemograms of Dogs with Thallium Poisoning Following Their Admission to the Clinic

Dog No.	Hb.	w.b.c.	PCV	Lymph.	Neut.	Juv.	Nonseg.	Seg.	Eos.	Baso.	Mono.	Sed. rate
SE 2582	20.0	17,200	60	7	93	0	6	87	0	0	0	0 mm./hr.
SF 1777	21.3	20,800	60	4	96	0	5	91	0	0	0	0 mm./hr.
SH 116	17.8	16,200	55	5	94	5	20	69	0	0	1	2 mm./hr.
SH 508	16.1	10,800	50	4	82	0	10	72	10	0	4	0 mm./hr.
SH 2798	17.3	18,600	53	6	91	0	2	89	1	0	2	.....

on the basis of the history, physical examination, and radiologic findings. When performed, on December 29, an intense intestinal spasm and a ptosis of the left kidney were the only observable abnormalities.

The dog seemed to improve during the first 5 days following surgery; however, on January 4, he was listless, vomited, and had diarrhea. During the following 2 days, his conditioned worsened, and the skin about his lips became reddened. Although less extensive, the skin lesions were remarkably similar to those seen on dog SE 2582. On questioning the owner, it was learned that thallium had been used as a rodenticide on neighboring premises.

The dog died January 6. On necropsy, thallium was found in the liver, kidneys, and urine. Unfortunately, the correct diag-

weak, and emaciated. Its temperature was 100 F., the pulse 120 per minute, and respiration labored. The skin of the feet was swollen, oozing serum, and crusted; about the mouth, it was dry and scaly. Thallium was found in the urine.

This dog was placed on therapy previously described. He vomited once on the first day of hospitalization. After 2 days of therapy, he appeared more alert but still refused food. After 5 days of treatment, improvement was apparent. He ate well, was moderately alert, and had soft but otherwise normal stools. The treatment was discontinued and the dog was discharged after 6 days of hospitalization. The owner later reported that the dog continued to make good progress at home

TABLE 2—Results of Initial Urinalyses of Dogs Following Their Admission with Thallium Poisoning

Dog. No.	Color	Turbidity	Sp. Gr.	pH	Sugar	Acetone	Bilirubin	Occ. Bld.	Albumin	Micro. findings
SE 2582	Dark yellow	Clear	1.040	6.5	Neg.	Pos.	Neg.	Neg.	3+	None
SE 2646	Clear	Yellow	1.030	6.5	Neg.	Neg.	Trace	Neg.	Neg.	Few granular cast/1pf 2-10 w.b.c.
SF 1777	Yellow	Clear	1.020	6.5	Neg.	Neg.	Neg.	Neg.	Neg.	None
SH 116	Yellow	Slightly cloudy	QNS*	7.0	Neg.	Neg.	Neg.	Neg.	4+	Occ. w.b.c.
SH 508	Dark yellow	Clear	QNS	7.5	Neg.	Neg.	Pos. mod.	Neg.	3+	Occ. granular cast
SH 2798	Yellow	Cloudy	1.036	6.0	Neg.	Neg.	Pos.	Neg.	4+	1-2 Granular cast/1pf occ. w.b.c.

*Quantity not sufficient.

TABLE 3—Results of Initial Chemical Analyses of Blood of Dogs with Thallium Poisoning

Dog. No.	Blood urea nitrogen	Blood glucose	Brom-sulfalein retention	CO ₂ combining power	Thallium Determination (urine)
SE 2582	4	93	6.4% retention	-----	+
SE 2646	29	-----	-----	-----	+
SF 1777	-----	75	-----	-----	+
SH 1116	8	133	-----	-----	+
SH 508	5	-----	-----	-----	+
SH 2798	19	-----	-----	22.1 vol. % 10.1 mEq./l.	+

Case 4 (SH 116).—A spayed female German Short-Haired Pointer, 4 years old, was referred to the University of Minnesota veterinary clinic. Six days prior to submission, the dog was listless, vomited after drinking water, had dark urine, and was weak. There was no evidence of pain. She had been given mineral oil and other treatment, including an enema, for bacterial enteritis.

At the time of admission, Jan. 14, 1959, she was depressed; her temperature was 101.4 F., pulse rate 136 per minute, and respiratory rate 12 per minute. Her lips were swollen and the skin of the axillary region and chest was reddened. The conjunctivae were congested. Thallium intoxication was suspected and later confirmed by the detection of the metal in the urine.

Progress was apparent after 5 days of diphenylthiocarbazono therapy. The dog developed diarrhea one week after admission, but improved after 2 days' treatment. She ate voluntarily on the sixth day and continued to have a good appetite. During hospitalization, the epidermis sloughed from the lips and 1 foot pad.

The dog was released from the hospital after 11 days. The owner informed the staff on this date that he had learned that a factory near his home had employed an exterminator to control rats on the premises and that thallium was thought to have been the agent used.

Case 5 (SH 508).—A male Beagle, 11 months old, was admitted to the clinic on April 7, 1959, with a history of being listless and inappetent for 4 days. The owner indicated that the dog had shivered frequently and had scratched the skin about his eyes.

During the initial examination, the dog's rectal temperature was 102.7 F., pulse rate 120 per minute, and respiratory rate rapid. The conjunctivae were congested, and there was erythema in the inguinal

areas, the inner surfaces of the pinnae, the axillae, and the muzzle.

On the basis of clinical findings, treatment for thallium intoxication was started immediately. The urine was analyzed for thallium and found positive. After little or no progress during the first 3 days of hospitalization, the dog gradually improved and was discharged April 13. When examined on April 17, his appetite was only fair, but he was alert and willing to play. Three weeks later, he appeared to have completely recovered.

Case 6 (SH 2798).—A male Labrador Retriever, 8 years old, was referred to the clinic on Dec. 28, 1959, with a temperature of 102.5 F., pulse rate 160 per minute, and superficial necrosis of the skin in the inguinal regions, on the lips, and foot pads. He was lame and sensitive on all of his extremities and there was excoriation on the second digit of the left forefoot. The skin on his scrotum was scaly and dry. He had been acutely ill for 4 days before he was submitted, during which time he vomited and was depressed.

The character of the skin lesions suggested the possibility of thallium poisoning. A urine sample was analyzed and found to contain the metal. Diphenylthiocarbazono therapy was started and the lesion on the left forefoot was lightly bandaged for 4 days. The dog was extremely depressed. Because he refused food, he was force-fed; he was given potassium chloride (2 Gm., t.i.d.) daily after the fifth day of hospitalization.

On the seventh day in the hospital, the dog developed ulcerative keratitis. In addition to other therapy, chloramphenicol solution* was applied to the eyes twice daily and vitamin A (250,000 units) was given orally. On the ninth day, the dog

*Chloromycetin Ophthalmic Solution, Parke Davis and Co., Detroit, Mich.

appeared much brighter, but still had signs of pain when he tried to walk. At this time, it was discovered that pressure produced by the bandage on the forelimb had caused skin damage. The superficial layers of the epidermis were undergoing necrosis and appeared to be in the process of sloughing. By this time, severe ulcers had developed on the elbows. A plastic-covered pad was provided in the cage to minimize further decubital damage.

On the ninth day of hospitalization, it was learned, as a result of a carbon dioxide combining power determination performed on the blood of this dog, that he was in a state of acidosis. To correct this condition, sodium bicarbonate (80 gr./day) was given the next 4 days and then discontinued. The dog voluntarily ate on the fifteenth day in the hospital.

On the sixteenth day, a swelling appeared on the right side of the chest, which eventually became an atypical poorly walled, minimally inflamed abscess. It is believed that the pressure produced by fluids administered in this area was primarily responsible for the abscess.

The dog made slow progress. On the seventeenth day of hospitalization, the penicillin and streptomycin therapy was replaced by tetracycline (500 mg., b.i.d.). In addition, beef extract (1 oz., b.i.d.) was given orally. On the 21st day, liver extract, multiple vitamins, and injectable iron were given to help correct an anemia which had developed. The patient continued to improve and was discharged after one month of hospitalization.

Diagnosis

The clinical diagnosis of thallium poisoning is based on history, clinical signs, laboratory confirmation, and circumstances which would allow the dog access to thallium. The clinical manifestations of typical skin lesions, emesis, diarrhea, depression, dehydration, and inappetence are important. Urinalysis, hemograms, chemical analyses, and electrocardiograms are helpful. Heavy metal in the urine or blood, or finding thallium specifically, is confirmatory.

A laboratory technique developed by Hammond *et al.*³ for the detection of lead in biological materials has proved useful. The method has not been fully characterized as to its application in the detection of thallium; however, a positive reaction was

observed in all cases in this report when 2 ml. of urine or 500 mg. of liver were tested. The only metals which react in this procedure are lead, bismuth, thallium, and stannous tin. Numerous samples of normal canine urine have always yielded a negative reaction.

A second test for thallium has been reported.¹⁰ A third test consists of flaming the material, preferably urine.⁹ A green color is obtained in the presence of thallium. Degree of specificity obtained by this method is not indicated.

Treatment

Sodium iodide, sodium thiosulfate, calcium salts, and pilocarpine (to increase secretory functions) have been used to treat dogs with thallium intoxication, but few if any recoveries have been reported.^{2,9}

When used experimentally,⁷ dimercaptopropanol (BAL), calcium disodiummethylenediaminetetraacetate (Ca-EDTA), and Dowex-50 (cation exchange resin) were not effective. The latter 2 products are believed to have more affinity for calcium than thallium.⁷ None of these agents enhance excretion of thallium. Diphenylthiocarbazone, by contrast, forms a firm complex with thallium and aids in the elimination of the metal through the urinary tract and intestines. Activated charcoal given orally caused 82 per cent greater excretion than was seen in control dogs. Diuretics, acetazolamide* and mercaptomerin sodium,** had no effect on the elimination of the toxic agent. Potassium salts increased the elimination of thallium salts by 47 per cent over the amount eliminated by control dogs. Cystine effected an increased elimination of thallium. All of this experimental work was done with rats and rabbits.

The treatment with which we have had excellent results consists of: (1) diphenylthiocarbazone, 70 mg./kg. of body weight, t.i.d.; (2) potassium chloride, 2 to 6 Gm. daily; (3) supportive treatment—(a) vitamin B complex, (b) fluid therapy (Fox solution, normal saline solution, dextrose (5%) in normal saline solution), (c) adequate nutrition (force-fed if necessary); and (4) comfortable quarters (soft, protective bedding).

Sodium bicarbonate should be adminis-

*Diamox, American Cyanamid Co., New York, N. Y.

**Thiomerin, Wyeth Laboratories, Inc., Philadelphia, Pa.

tered if the dog develops acidosis. Antibiotics may be given if there appears to be a need for such products (leukocytosis, suppurating lesions, large areas of necrosis).

Discussion

Thallium salts are commonly used as rodenticides by commercial exterminators. The lethal dose for the dog is 15 to 25 mg./kg.⁶ Thallium is readily absorbed from the alimentary tract and is eliminated by both the alimentary and urinary tracts. It is found in greatest concentrations in the pancreas, muscles, kidneys, heart, spleen, bones, and liver in the order listed.² Tissue levels for this element far exceed blood levels during intoxication.²

The few instances of thallium poisoning with which the authors have had experience have occurred in the winter and early spring. It is assumed that with the advent of cold weather the rats move into buildings; the property owner becomes aware of the infestation and takes steps to control the problem.

The dogs seen at the University veterinary clinic were noticeably ill 4 to 10 days prior to admittance. All had a history of emesis and diarrhea, were depressed and dehydrated, and all had erythema and necrosis of the superficial layers of the skin.

At the time of initial examination in the clinic, the dogs in this series, with 1 exception, had temperatures within the limits considered normal. The heart and respiratory rates were increased; the visible mucous membranes were brick red to mahogany in color; and skin lesions were found in the frictional or pressure areas of the body. Pressure from any source seemed to cause erythema which might be followed by necrosis. In dog SH 2798, a light protective bandage caused sufficient damage to make the superficial layers of the skin of the limb slough, and the pressure of fluids given subcutaneously apparently caused pressure necrosis of the skin and subcutaneous tissues. Typical skin lesions first become hyperemic, then turn black after 2 to 3 days. The blackened areas separate from the deeper tissues and slough in large plaques. Hair follicles are seldom destroyed.

Corneal lesions in a dog recovered from thallium poisoning, in which one eye was

perforated and the other developed a keratocele, have been reported.¹¹ Dog SH 2798 of this series developed bilateral corneal ulcers which responded well to treatment.

The initial hemograms of these dogs, after admittance to the clinic (table 1), indicated that all dogs in this series had hemoconcentration. In general, they had a mild leukocytosis with minimal immaturity, a relative lymphopenia, and normal sedimentation rate.

The results of the initial urinalysis performed on each dog of this series are shown (table 2). The degree of dehydration dogs suffer with thallium intoxication is reflected in the high specific gravity and deep color of the urine voided. The presence of bilirubin in 50 per cent of the dogs of this series suggested liver damage. Since none were icteric, it is believed that the liver damage was not extensive. Proteinuria and granular casts were indicative of some kidney damage. A phenolsulfonphthalein test on 1 dog in early convalescence indicated normal kidney function (46% of the injected dose excreted in 15 minutes). This suggests that the kidney lesions are reversible.

Attention is called to the fact that none of these dogs had evidence of glycosuria. The drug used in treatment in this series of dogs will produce diabetes mellitus in rabbits⁴ but not in dogs.¹

Results of some of the initial chemical analyses performed on specimens from the dogs in this group are summarized (table 3). In instances where subsequent test results are of interest, comment is made.

The blood urea nitrogen levels did not exceed accepted normal limits, except in dog SE 2646, in which the level rose to 29 mg./100 ml. of blood. In 2 dogs, the blood urea nitrogen levels were lower than those usually obtained from normal dogs and were interpreted as evidence of liver damage. In a bromsulphalein excretion test performed on 1 dog (SE 2582), a 6.4 per cent retention of the dye was measured after 30 minutes. This was believed to suggest liver damage.

Blood glucose determinations were made in an effort to detect any diabetogenic effect such as can occur in rabbits which receive diphenylthiocarbazon. All values were within the range accepted as normal for the dog. No evidence of diabetes was detected in dog SH 2798 after 15 days of therapy.

Two dogs produced excessively acid urine (pH of 5.5 and 5.6) during hospitalization. A carbon dioxide combining power determination on the blood of dog SH 2798 indicated a level of 22.1 vol./100 ml. of blood or 10.1 mEq./liter. The dog was given sodium bicarbonate and 3 days later the level was 59.8 vol./100 ml. or 26.9 mEq./liter of blood. The alkalinizing treatment was discontinued.

In electrocardiograms on 2 dogs, the S-T segment was slurred during the period of illness but not following recovery. This change is generally considered indicative of a functional disturbance of the myocardium, which in these instances appeared reversible.

All dogs in this series had thallium in their urine.

The necropsy findings on dog SE 2646 were hemorrhagic enteritis, enlarged congested kidneys, and mottled congested lungs.

Summary

1) The clinical and laboratory findings in 6 dogs with thallium poisoning were normal temperature, increased heart and respiratory rates, and congestion of the visible mucous membranes. Necrosis of the skin on the frictional areas was commonly observed.

Hemoconcentration, mild leukocytosis, relative lymphopenia, and normal sedimentation rates were found in blood samples taken at the time of admission. Blood urea nitrogen and blood glucose levels were normal.

Proteinuria, granular casts, and bilirubinuria were found on urinalysis.

2) All of 5 dogs treated with diphenylthiocarbazonone recovered.

3) One dog was given no specific therapy and died.

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Residual Penicillin in Syringes

Contamination of syringes is one of the most frequent hidden sources of penicillin exposure and one of great clinical importance. Either syringes or the water used in sterilizing solutions may account for this contamination. This transfer could be eliminated only after separation of the syringe parts, 2 or more washings, and autoclaving. A solution of penicillin boiled for more than 16 hours still produced a positive passive transfer test reaction on a site previously sensitized. Adding new sterilizing water as the old solution boils away is poor technique. A preferable procedure would be a complete and frequent change of sterilizer water.—*Postgraduate Med. (Jan., 1960); abstr. in J.Am. M.A.*, 172, (1960): 1653.

Drinking Fountain for Dogs

William I. GAY, D.V.M.
John L. CARTER, Jr., B.S.

A WATERING UNIT for dogs, which has proved economical in construction, operation, and maintenance and which is not easily upset or contaminated, has been developed and used successfully by the Animal Hospital Section of the Laboratory Aids Branch, National Institutes of Health, U. S. Public Health Service.

Until recently, dogs quartered at the Animal Hospital Section, when kept in groups of 2 or 3 in the indoor-outdoor runs, were given water in shoe box-shaped stainless steel pans. This method was unsatisfactory for 3 reasons: (1) during warm weather the pans had to be filled several times a day, (2) the water was frequently contaminated by urine and feces, and (3) the pans were frequently upset by the dogs.

Water fountains, commercially available, now provide a constant supply of fresh drinking water for most livestock and laboratory animals. The authors were unable, however, to secure a dependable automatic watering device which was steady, sturdy, and sanitary.

Standards

It was decided that an automatic watering device should conform to the following standards:

- 1) It should fill automatically to provide fresh water at all times.
- 2) The watering dish should be designed so that it may be removed easily for cleaning.
- 3) The design should prevent back-siphoning into the water supply system.
- 4) The valve should be protected to prevent dogs urinating on it or licking it.
- 5) The device should be designed to permit its installation in a corner 4 to 6 inches

From the National Institutes of Health, U. S. Public Health Service, Department of Health, Education, and Welfare, Bethesda, Md.



Fig. 1—The valve assembly of the automatic water fountain. The sleeve (1) which attaches the bracket to the cap (2) has been removed to demonstrate the spring (3), adjustment nuts (4), and valve stem (5). Modifications made were $\frac{1}{8}$ -inch holes in the bottom of the sleeve (A) and a brass collar (B).

from the walls. This will protect the unit from inadvertent contact by the dogs as well as facilitate cleaning of the adjacent walls and floors.

Development

Pilot models were constructed using valves which were operated by levers or solenoid switches. These were expensive to construct and would have required considerable maintenance. An automatic watering device was designed according to the above standards, utilizing the valve assembly of an automatic fountain available

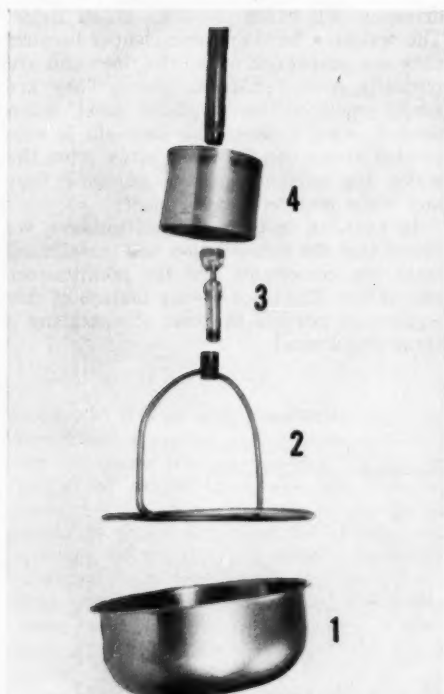


Fig. 2—The automatic watering device consists of a stainless steel bowl (1) which fits into a bracket (2) attached to the valve assembly (3). The valve is protected by a steel cylinder (4).

commercially.* Tests proved this watering valve to be automatic and dependable. It simplified construction of suspended water fountains because it is operated by the weight of water in the dish attached to its threaded base or sleeve (fig. 1). When the level of the water in the dish drops, the spring of the valve assembly raises the base against the valve stem tip, thus opening it. This valve is similar to those used commonly in automobile tires. As the valve opens, water fills the sleeve and overflows into the dish below. The weight of water in the pan lowers the sleeve, causing the valve to close.

The device was constructed as follows.

1) Three modifications were made in this valve to adapt it for our device.

a) Four $\frac{1}{8}$ -inch holes were drilled in the bottom of the sleeve to allow the water to flow directly into the bowl (fig. 1).

b) A brass collar (fig. 1) was placed above the

adjustment screws to increase tension on the spring and make its action more positive with the heavy bracket and bowl.

c) A steel washer, which was originally between the 2 brass adjustment screws, was omitted from the modified valve assembly because electrolysis occurred between the dissimilar metals. Rapid corrosion of the valve assembly was thus avoided.

2) A bracket or bail was designed (fig. 2) which will hold the pan beneath the valve assembly and allow easy removal of the pan for cleaning or exchange. The frame of this bracket was made of $\frac{1}{4}$ -inch stainless steel rods, electrically welded at the joints. This bracket was electrically welded to a stainless steel coupling which attached it to the threaded base of the fountain. The bracket or bail was designed to accommodate a 10-inch stainless steel bowl which is standard equipment in our colony.

3) The base of the valve was located well above the surface of the water in the bowl, providing an air-gap which prevents back-siphoning into the supply line (fig. 3).

4) The valve was protected by a cover or a cap (fig. 3), to prevent the dogs from licking the valve or urinating on it.

5) The entire device was designed to be suspended above the floor by an attachment to the end of the water supply pipe (fig. 3).

Results

During an 8-month trial period, only a few valves needed adjusting, but none had



Fig. 3—The automatic dog watering device as installed in the dog kennels at the National Institutes of Health.

*The G and S Sales Co., St. Paul, Minn.

to be adjusted more often than once a month. Only 1 device has been broken; this was due to rough handling. The fountains which have been installed in 80 kennels have continued to operate as well or better than those evaluated during the trial period.

Advantages

The automatic drinking fountain for dogs, as described in this report, contributes several desirable features to the humane and sanitary aspects of laboratory dog care. Principally, it provides fresh

drinking water for the dogs at all times. The watering bowls remain cleaner because they are suspended above the floor and are partially protected from above. They are easily replaced by a clean bowl when needed. Also, because the fountain is suspended above the floor and away from the walls, the surfaces of the adjacent floor and walls may be cleaned easily.

In addition to the above advantages, we found that the construction and installation costs are reasonable and the maintenance cost is low. The labor-saving feature of this equipment reduces the cost of operating a large dog kennel.

Response of Individuals to Injection with Ether-Killed *Brucella abortus*

In a study designed to ascertain the practicability of employing an ether-killed *Brucella abortus* vaccine for the protection of man, individuals in one group were given ether-killed *Br. abortus* in saline; those in another group were given the killed virus precipitated with alum. Subsequently, serums were obtained at frequent intervals for the purpose of carrying out agglutination tests, opsonocytaphagic tests, and mouse-protection tests. There was a marked rise in the agglutinin titers, in the phagocytic activity of the blood, and the ability of the serums to protect mice against subsequent challenge with *Br. abortus*.

While an increase in agglutinins and opsonins cannot be considered of definite immunologic significance in brucellosis, the rise in protective substance, as shown in the mouse experiments, may be associated with resistance against *Brucella* infection. The alum-precipitated vaccine proved more effective than the saline vaccine in stimulating the height and persistence of the protective activity. Furthermore, a large percentage of the vaccinated persons dermal sensitivity to *Brucella* antigen, which may be of immunologic significance.—I. Live and B. Wolf in *Am. J. Pub. Health*, 50, (July, 1960): 966.

Undifferentiated Carcinoma

in the Maxilla of a Dog

Robert S. BRODEY, D.V.M., M.Sc.
Alvin L. MORRIS, D.D.S., Ph.D.

AT LEAST 2 dogs with odontomas have been previously reported in the literature. In 1, the odontoma was located between the upper right canine tooth and the first premolar.⁴ This lesion consisted of 3 separate denticles which displaced the canine tooth upward. In the other, a complex composite odontoma was mentioned,⁶ but no description of the lesion was given. Odontomas have been reported in the horse,^{1,8} sheep and ox,⁴ a Holstein-Friesian bull,⁶ and in rats.³

An odontoma⁹ is a growth in which the mesenchymal and epithelial cells completely differentiate to form enamel and dentin. These tissues are usually laid down in an abnormal pattern due to failure of the odontogenic cells to reach a normal state of morphologic differentiation. A compound composite odontoma is one which contains structures which anatomically resemble teeth. In a complex composite odontoma, the calcified dental tissues have no morphologic similarity to well-developed or rudimentary teeth. An odontoma probably should be classified as a hamartoma (a tumor-like malformation), rather than as a true neoplasm.¹²

Case Report

A male Dalmatian,² 10 months old, was brought to the University of Pennsylvania veterinary clinic on April 20, 1954, because of a swelling in its right maxilla, which

the owner had observed at the time of the dog's purchase 2 weeks before. Except for this enlargement of its upper jaw and occasional loud breathing sounds, the dog appeared to be in excellent health.

The only significant pathologic findings were related to the bony maxillary swelling. The right upper gingiva from the second to the fourth premolar was studded with supernumerary teeth which varied greatly in size, shape, and degree of eruption (fig. 1). These teeth were present on the lateral, ventral, and medial aspects of the gingiva, as well as on the adjacent hard palate. Several blue-colored cysts, varying from 1 to 2 cm. in diameter, were located at the gingivolabial vestibule.

On radiographic examination of the head, a lesion extending posteriorly from the root of the upper right canine tooth to the root of the last molar, a distance of 8.7 cm., was found (fig. 2). The maximal dorso-ventral measurement of the mass was 3.7 cm. The dorsoventral radiograph indicated that the lesion occupied almost the entire right nasal cavity, with the exception of its posterior one fifth, and extended across the median nasal septum into the posterior third of the left nasal cavity, for a total lateral-medial dimension of 4.4 cm. (fig. 3). The lesion contained hundreds of irregular calcified densities which resembled small teeth. The diagnosis, based on the clinical and radiologic findings, was compound composite odontoma.

The following day, the dog was anesthetized with pentobarbital sodium and the gingival mucosa in the area of the lesion was reflected upward allowing removal by curettage of approximately 75 toothlike structures (fig. 4). These structures varied

From the University of Pennsylvania, Philadelphia, where Dr. Brodey is assistant professor of veterinary surgery, School of Veterinary Medicine, and Dr. Morris is associate professor of oral medicine, School of Dentistry.

The authors thank Dr. H. A. Reynolds for performing the necropsy.

in size and shape but all were clearly recognizable as teeth. The dog recovered rapidly and was discharged from the hospital on April 25, 1954.

The dog remained in good health until March 15, 1959, at which time it developed a rapidly progressive syndrome characterized in its early stages by sneezing, right-sided epistaxis, and polydipsia. A few days later, the owner observed a swelling of the right side of the face with protrusion of the right eye and a copious purulent ocular discharge. The epistaxis soon became bilateral and profuse. The dog lost considerable weight.

On April 2, 1959, the dog was seen at the clinic for the second time. He was depressed, unthrifty-looking, and had extensive right-sided facial distortion. There was proptosis of the right eye with severe conjunctivitis and constant drainage of purulent exudate from the medial canthus

change in the appearance or extent of the odontoma except in the area which was previously curetted (fig. 6 and 7). However, there was partial destruction of the posterior third of the median nasal septum by a soft tissue mass which opacified the left nasal cavity and extended to within 1 cm. of the external nares. There was also considerable cloudiness of both frontal sinuses, particularly in their anterior half. On radiographic examination of the thorax, metastases were not found.

The dog was hospitalized and a biopsy was made of the lesion on the right gingiva. During the short period of hospitalization, the dog's condition deteriorated rapidly. The ocular discharge increased, and the epistaxis became so profuse that it could not be controlled. When the gingival lesion was diagnosed as an undifferentiated carcinoma, the dog was euthanatized on April 7, 1959.

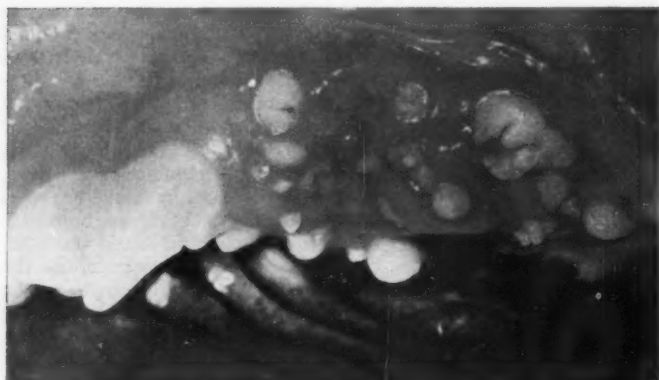


Fig. 1—Compound composite odontoma of the right upper premolar area of a Dalmatian. Many teeth varying greatly in size and shape project into the ventral and lateral gingiva, as well as the adjacent hard palate.

down the side of the muzzle. The epistaxis was more severe on the right side. Several soft vascular masses approximately 2 cm. in diameter were situated on the upper right gingiva in the exact location of the previous surgery for the odontoma in 1954 (fig. 5). A few small, supernumerary teeth were still present in the vicinity of this soft tissue lesion. There were superficial erosions on the ridges of the posterior half of the hard palate. The mandibular and retropharyngeal lymph nodes were moderately enlarged and indurated.

Radiographic examination of the head indicated that there was no apparent

Necropsy Findings

All significant pathologic changes were limited to the head and neck. Both frontal sinuses contained copious amounts of a viscid, tan-gray, mucopurulent exudate (fig. 8). On culture of this fluid, there were a predominance of coliform organisms with some hemolytic streptococci. The odontoma was composed of innumerable small teeth; it filled the posterior four fifths of the right nasal cavity and a small portion of the posterior third of the left nasal cavity (fig. 9). The soft tissue mass consisted of

Fig. 2—Lateral radiograph of the head of the dog. The odontoma extends from the root of the canine tooth to a point posterior to the last molar.

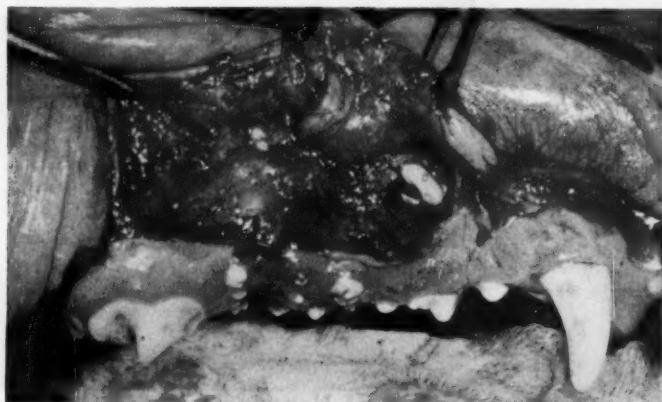
Fig. 3—Dorsoventral radiography of the head of the dog. A lesion composed of innumerable toothlike densities fills most of the right nasal cavity and bulges into the right maxillary region. The odontoma is also present in the posterior part of the left nasal cavity.



dark gray tissue mottled with areas of red and red-black, which intermingled with the odontoma on the right side and extended into the right sphenoidal area. It was intimately attached to the inner surface of the maxilla and the dorsal aspect of the palatine bone. This soft tissue mass had also eroded the posterior portion of the median nasal septum and filled the entire left nasal cavity where it had destroyed almost all of the maxillary and

nasal turbinate bones. The tumor was intimately attached to the floor of the left nasal cavity, but it was readily lifted away from all other structures. Another portion of this soft tissue mass was smooth and hemispherical and was attached to the dorsal surface of the palatine bone in the anterior portion of the nasopharynx. The retropharyngeal lymph nodes were enlarged and moist, but there was no gross evidence of metastasis.

Fig. 4—Elevation of a large mucosal flap overlying part of the odontoma. Approximately 75 toothlike structures were removed by curettage. Several of these are still present in the surgical site.



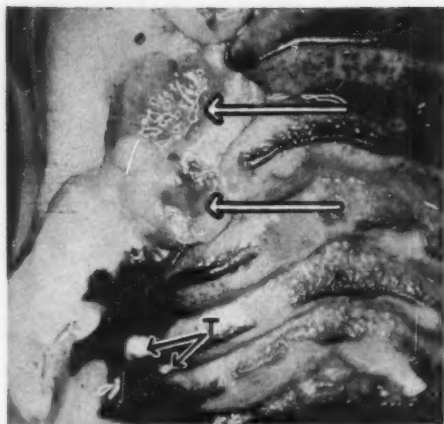


Fig. 5—Two soft highly vascular masses (arrows) observed in April, 1959, are present in the site of the surgical incision made in 1954 (fig. 4). There are 2 small teeth (1) in the hard palate, as well as multiple erosions of the palatine ridges.

Microscopically, the soft tissue mass was seen to consist of anastomosing islands of undifferentiated basophilic-staining cells which were surrounded by a fairly dense well-vascularized stroma. Hemorrhage into this stroma was a prominent feature. Some areas contained large blood-filled vascular

spaces. The tumor cells contained large, round-to-polyhedral nuclei with little cytoplasm or intercellular cementing material. There was moderate variation in nuclear size, and mitotic figures were numerous; however, the over-all pattern was uniform (fig. 10). In some areas, these cells invaded vascular spaces. Clumps of cells identical to those just described were found in the subcapsular space of one of the retropharyngeal lymph nodes (fig. 11).

Numerous masses of dentin which varied greatly in size and shape were present in the decalcified sections from the hard tissue mass. In some areas, the dentin assumed the shape of a tooth root and was surrounded by cementum. In other areas, the dentin was surrounded by a clear space which presumably had been occupied by enamel prior to decalcification (fig. 12). The tissue surrounding the individual teeth contained small amounts of bone but was primarily composed of sheets of cells similar to those from the soft tissue mass previously described. The diagnosis of compound composite odontoma with an associated undifferentiated carcinoma was made.

Discussion

The severe frontal sinusitis was due to neoplastic obstruction to normal drainage



Fig. 6—Dorsoventral radiograph of the upper jaw of the Dalmatian taken after necropsy. Except for the small lateral portion previously removed surgically, the boundaries of the odontoma correspond to those of 4 years before. The posterior four fifths of the left nasal cavity is opacified by a diffuse soft tissue mass.

Fig. 7—Lateral radiograph of the right half of the upper jaw of the dog after necropsy. The odontoma is clearly outlined; several teeth can be seen dorsal to the main lesion.

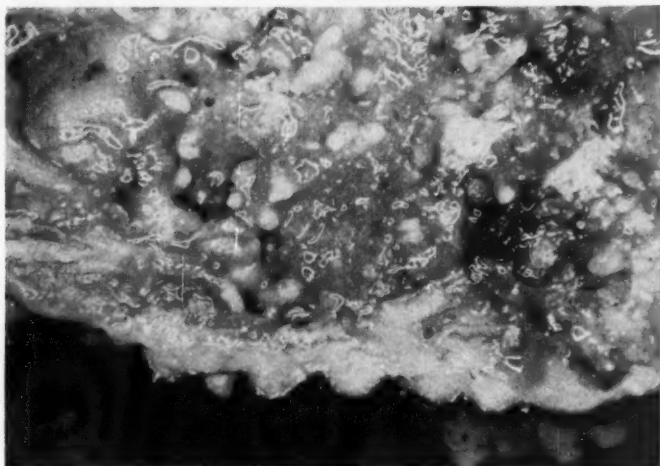


through the ethmoturbinates. The profuse overflow of exudate from the medial canthus of the right eye was probably related to occlusion of the nasolacrimal duct by the intranasal tumor. The proptosis of the right eye resulted from destruction and displacement of the right ethmoidal bone

Fig. 8—Bilateral Purulent frontal sinusitis. The cranial cap has been removed, exposing the cerebral hemispheres.



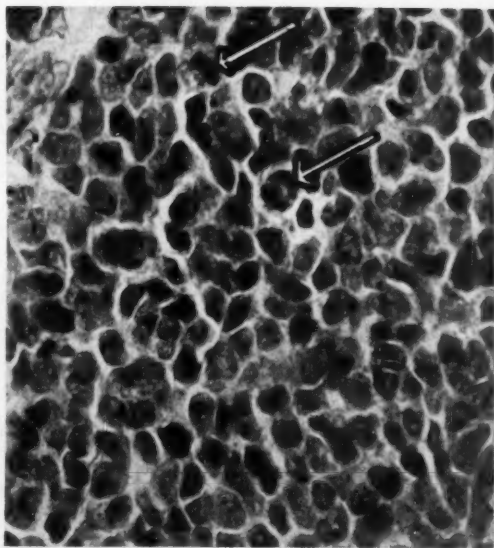
Fig. 9—Sagittal section of the odontoma revealing great numbers of small teeth imbedded in a diffuse gray-red soft tissue mass. The ventral boundary of the lesion is formed by the hard palate.



which forms the medial wall of the bony orbit. The severe right-sided changes (epistaxis, ocular discharge, proptosis of the eye, and facial deformity) suggest that the soft tissue lesion also originated in the right nasomaxillary area which was the site of the main portion of the odontoma.

The presence of 2 lesions occurring in the same general area 4 years apart poses a difficult problem in diagnosis, *i.e.* whether to consider these lesions as part of the same disturbance of growth or whether each lesion represents an entirely separate process. The problem would be less difficult if the cells of the soft tissue element were better differentiated as viewed micro-

Fig. 10—Photomicrograph of the epithelial portion of the tumor. The presence of marked cellularity, nuclear pleomorphism, and mitotic figures (arrows) indicate malignant nature of tumor. x 850.



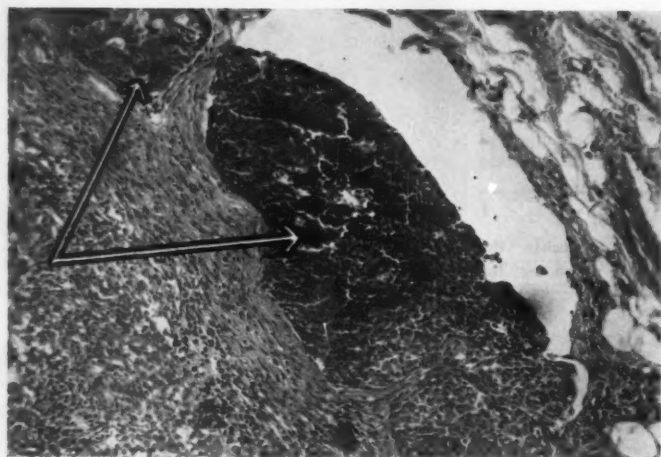


Fig. 11—Two foci of metastatic carcinoma (arrows) appear in the subcapsular region of the right retropharyngeal lymph node. Normal lymphoid tissue appears in the lower left.

scopically. The microscopic sections were reviewed by 10 well-qualified oral, veterinary, and general pathologists. While all agreed that an undifferentiated carcinoma was present, there was general disagreement as to whether the tumor arose from odontogenic, squamous, or transitional epithelium.

That an odontoma and ameloblastoma can occur or develop together has been reported in the literature, and it is usu-

ally described as an ameloblastic odontoma.^{5,7,10,11} There has been no documentation, however, of a case of an odontoma which subsequently underwent an ameloblastic change. The close gross and microscopic association of the hard and soft tissue elements in this case suggests a common origin. Odontomas have rarely been reported in dogs and there is no report of an ameloblastoma occurring in this species. Therefore, the morphology of such a lesion

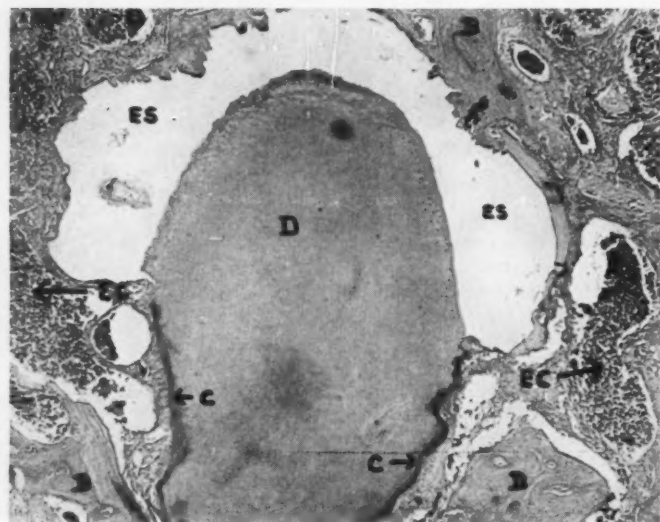


Fig. 12—A tooth surrounded by nests of epithelial cells is visible on histologic section of the tumor; D = dentin; ES = enamel space (enamel removed during decalcification), C = cementum, B = bone, and EC = epithelial component.

remains in question. While none of the typical histologic criteria for an ameloblastoma were present in this case, the anaplasia is of such degree that it is not possible to rule it out.

There are several aspects of the case which support the view that the odontoma and undifferentiated carcinoma developed entirely separately. The 4-year interval between the time the odontoma was first seen and the carcinoma identified, coupled with the rapid onset of the clinical syndrome, which led to the return of the dog, suggests a recent initiation of the latter lesion. Also, there is no evidence, based upon comparative radiographic studies, that the odontoma was undergoing active odontogenesis during the 4 years. The frankly malignant nature of the soft tissue element is evidence against it being an ameloblastoma, judging by experience with this tumor in man.

Summary

A complex composite odontoma developed in the maxilla of a Dalmatian dog. Four years later, there was little radiographic evidence of change in the tumor. At that time, however, a rapidly progressing, undifferentiated carcinoma was observed both grossly and microscopically to be in direct association with the odontoma. It was not

possible to determine from what cell type the carcinoma originated or whether it developed independently of the odontoma.

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Semple vs. Duck Embryo Rabies Vaccine

Duck embryo-killed rabies vaccine was compared with Semple rabies vaccine in the prophylaxis of rabies. Local reactions occurred to about the same extent in groups of patients treated with each. Two cases of encephalomyelitis occurred in the 127 Semple-treated patients. Serum antibody titers began to rise sooner in the 123 given duck embryo vaccine; by the tenth day, 74 per cent of these had a titer of 1:4 or higher, in contrast with 35 per cent of those treated with Semple vaccine. By the fifteenth day, 86 per cent of both groups had developed measurable antibodies; about one month after the first injection, about 95 per cent had measurable antibodies.

A booster dose, given to 63 vaccinees 6

to 9 months after the beginning of treatment, evoked a booster response with titers higher than those reached after the primary series. Good responses were obtained whether the booster dose was duck embryo vaccine or Semple vaccine. Four persons who had received one or more series of injections as long as 20 years prior to the study still had circulating antibodies in their blood and responded with a booster effect after a single injection. The earlier development of antibodies and the absence of the complication of encephalomyelitis after the use of duck embryo vaccine suggests its use in the prophylaxis of rabies in preference to vaccines containing brain tissue.—*J. Am. M. A.*, 173, (1960): 333.

Traumatic Cleft Palate in a Cat

A cat which was brought to an animal clinic in Kingston, Jamaica, for veterinary care had been snuffling and sneezing ever since it had received a head injury in an auto accident. On examination, the cat was found to have a severely cleft palate, the cleft extending from $\frac{1}{2}$ inch behind the incisor teeth to the soft palate. Food passing into the nasal passages through this cleft was responsible for the snuffling and sneezing.

The cat was anesthetized, and the soft tissues and membranes of the roof of the mouth were dissected away from the palatine bones. An incision was made in an anteroposterior line on either side of the cleft to relieve tension and permit the operator more tissue with which to work at the cleft site. The edges were freshened until they were bleeding freely, and then a row of nylon sutures was inserted. A second row of 4 retention sutures $\frac{1}{8}$ inch apart was also inserted.

A week later, all sutures were still in place except the most posterior one. The wound was slightly open. The cat was anesthetized again, and a retention suture was inserted. The lateral wounds made to reduce tension had healed.

After another week had passed, the cat was again anesthetized and the sutures were removed. The palate had healed completely, and the cat was no longer snuffling and sneezing.—*Vet. Rec.*, 72, (July 16, 1960): 572.

Intramedullary Pin for Correction of Luxation of the Canine Hock Joint

A FEMALE Beagle, 6 months old, sustained a lateral luxation of the tibiotarsal articulation as a result of an automobile accident. Following reduction of the luxation, a threaded intramedullary-type pin was passed through the tuber calcis and then into the tibia at about a 45-degree angle (fig. 1). It was found that, by passing the threaded end of the pin through the medullary cavity and imbedding its tip well into the wall of the tibia opposite the tuber calcis, firm immobilization of the joint was achieved. The angle of insertion of the pin into the tibia was determined by the natural angle of the hock joint in the normal standing position of the dog.

The pin was removed after 1 month, and the dog regained normal use of the joint.

In this particular type of luxation, this procedure offers certain advantages over use of a cast, especially when swelling or lacerations are present. Progress of healing is easily observed, and the patient is allowed free use of the limb.—*Robert F. Burns, D.V.M., Lemon Grove Veterinary Hospital, Lemon Grove, Calif.*

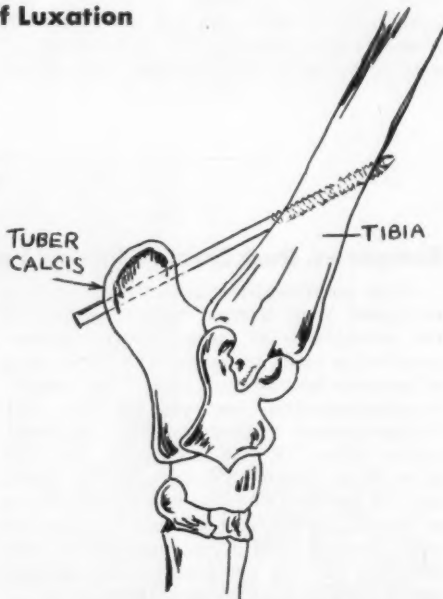


Fig. 1—Correction of tibiotarsal luxation in a dog, in which the tuber calcis and tibia are fixed with an intramedullary-type pin.

Editorial

Specific Pathogen-Free Pigs

Guest Editorial

A new slant on practical disease control has been introduced by veterinarians to the swine industry under the title of "swine repopulation." The basic tried and proved principles of practical isolation to control disease are supplemented by a technique to clearly delete exposure of the newborn pig to the diseases normally in its dam's environment. Pigs are delivered by hysterectomy and reared for the first few weeks in laboratory isolation. Normal farrowing for succeeding generations is resumed in isolation on farms and the specific pathogen-free* (SPF) offspring may be used to repopulate other farms.

The veterinary profession has been given the opportunity for frank leadership in a national swine repopulation program. University of Minnesota officials, who control the patented laboratory equipment and procedures involved and issue licenses at modest fees to govern their use, have decided that the high degree of skill necessary to successfully raise pigs in the laboratory can best be provided by veterinarians. Licenses for SPF laboratories are now granted only to graduate veterinarians.

Operation of an SPF laboratory is too time consuming to permit the veterinary specialist to also supervise SPF herds on farms. Thus, as SPF herds increase in number, supervision of these herds will become the responsibility of the general practitioner. Many laboratories have already elected to place pigs through local practitioners rather than directly with farmer clients. This presents an excellent opportunity for contract consultation by the practitioner in a disease-prevention program.

*The term "specific pathogen-free" or "SPF" pig has replaced the use of "disease-free" pigs as a descriptive term for pigs obtained by hysterectomy and raised in laboratory and farm isolation. This is a realistic change in terminology as "disease-free" denotes absence of all diseases, whereas SPF qualifies the disease status of pigs from a practical basis.

The number of SPF swine herds in the Midwest is increasing rapidly. By the end of 1960, more than 1,000 primary SPF herds will have been established, with 2,000 additional primary herds likely by the end of 1961. The naturally farrowed secondary SPF pigs produced by these herds beginning in 1961 will result in a geometric increase in SPF herds. Veterinarians called upon to service these herds must remember that they are high risk visitors. They should accept use of coveralls and boots offered by the farmer and take every precaution not to introduce disease from swine herds previously visited. Disease transmission by contaminated clothing and shoes is more than a hypothesis taught in veterinary colleges. Farmers familiar with sound disease control practices presented to them through literature on SPF pigs are totally confused by veterinarians who fail to observe those practices.

Two common reactions by practicing veterinarians to swine repopulation are: (1) skepticism that the program can succeed; and (2) concern that a successful program will hurt their swine practices. Experience has shown that neither of these reactions is justified. Swine repopulation does work; SPF herds have maintained high levels of performance through three generations. It is expected that some of these will retain an SPF status indefinitely. Vaccination against hog cholera by veterinarians using rabbit-origin, modified live virus vaccine and serum is recommended. Vaccination reactions will rarely be encountered because of the high level of health in SPF herds. Swine repopulation obviously cannot eliminate all problems related to swine raising; therefore, a lot of trouble-shooting will be left for the practitioner. However, the veterinarian now has the means to eliminate atrophic rhinitis, virus pig pneumonia, and swine dysentery from a client's herd. This

is a positive approach to the control of diseases previously difficult to handle.

The National Swine Repopulation Association was recently formed to conduct professional activities on behalf of the science of swine repopulation and to promote programs of recognition, certification, and accreditation of repopulated swine herds or their producers. This organization is open to practicing veterinarians on recommendations of two members in good standing. It will be the purpose of this organization to keep members informed of new developments in a new and rapidly expanding area of agriculture.

The swine repopulation program presents a new challenge to the veterinary profession, especially in the area of disease prevention. Proponents of swine integration grasp the significance of high health levels in swine herds and how swine repopulation would fit their programs. If veterinarians are not interested in participating in swine repopulation, others will be. Professionally we cannot afford to default swine practice as we have poultry practice and artificial insemination.—*George A. Young, D.V.M., Department of Veterinary Science, University of Nebraska, Lincoln.*

Say It Better • • •

Correct use of the term toxicity is easy to achieve if one remembers that toxicity indicates the property of a chemical, drug, or other toxic substance; toxicosis and intoxication denote the condition resulting from the toxin.

Rather than say that the animals were toxic, say they were *intoxicated* or *poisoned*. The *toxicity* caused by rumen gasses erroneously refers to the *toxicosis* or *intoxication* caused by them. Expect the medical editor to change treatment of nitrate *toxicity* to nitrate *toxicosis*, *intoxication*, or *poisoning*.

It's quite correct to refer to the toxicity of barbiturates and to toxicity studies; also, to say that a substance is toxic.

To Program Participants • • •

Veterinarians who are to appear on a program and are expected to submit a manuscript of the presentation are well advised to prepare an outline or special notes from which to speak but to write a separate manuscript expressly intended for publication. Oral presentations, even the good ones, seldom afford quality reading when reduced to impersonal print. Conversely, a manuscript that is excellent for publication purposes may, if read to an audience, doom the presentation to mediocrity.

from the *Research Journal*

Low Virulence Ornithosis Virus Strain

Subclinical cases of ornithosis occurred in turkeys inoculated intraperitoneally and intratracheally. The body temperature rose 0.5 to 4.5 F. Heavy mortality occurred in poults less than 2 weeks of age. The virus was recovered from turkeys 72 hours after inoculation and was still present at 120 days, but not at 180 days. Susceptibility appeared to coincide with a temperature rise

following inoculation. A serologic response, detected with the indirect and direct complement-fixation tests, seemed to reach a peak 30 days after inoculation and then began to decline.—[C. Gale: *Characteristics of an Ornithosis Virus Strain of Low Virulence in Turkeys*. *Am. J. Vet. Res.*, 12, (May, 1960): 486-490.]

Prevention of White Muscle Disease

A study was made to determine the effectiveness of barium selenate in preventing white muscle disease (WMD) in lambs when injected subcutaneously into ewes prior to parturition, and to confirm previous findings that sodium selenite was effective in preventing WMD when fed to ewes prior to parturition. Twenty-seven ewes were given barium selenate; 5 were given 0.05 Gm. and 22 were given 0.10 Gm./100 lb. of body weight, 3 to 16 weeks prior to parturition. No cases of WMD occurred in their lambs, even though the ewes were being fed dystrophogenic rations. Sodium selenite, when fed at the rate of 0.1 parts/million to 6 ewes, beginning about 2 months before parturition and continuing 2 months after parturition, was adequate to prevent WMD in their lambs.

The effects of selenium on lambs given a dystrophogenic ration of skim milk and cod liver oil was also tested. The addition of 1 part/million selenium did not prevent the development of high serum glutamic-oxalacetic transaminase levels, clinical signs, and lesions typical of WMD. The addition of 200 units of vitamin E daily to this cod liver oil-skim milk ration did prevent the development of clinical evidence of WMD.—[K. L. Kuttler and D. W. Marble: *Prevention of White Muscle Disease in Lambs by Oral and Subcutaneous Administration of Selenium*. *Am. J. Vet. Res.*, 21, (May, 1960): 437-440.]

Etiologic Agent of Monkeypox Isolated

Attempts were made to isolate the etiologic agent of monkeypox from naturally affected animals. A viral agent from a monkey with a fatal case was isolated in rabbit renal cell cultures. Similar isolates have been made from 3 other affected animals. The agent produces cytoplasmic inclusion bodies in tissue culture, is pathogenic for several cell lines of human and animal origin, and is readily propagated on the chorioallantoic membranes of chicken embryos. A pock lesion, typical of the pox group of viruses, is produced on the chorioallantoic membrane. The agent produces a hemagglutinin which is neutralized by anti-vaccinia serum. Specific antimonkeypox virus

serum also inhibits the hemagglutinin of vaccinia virus. The monkeypox virus is pathogenic for mice given intracerebral inoculations and for rabbits given intradermal and subcutaneous injections; it produces a local lesion in the foot pads of guinea pigs. Intravenous injection of the virus in monkeys produces a generalized typical case of monkeypox. On neutralization and serologic tests, the virus seems to be a member of the variola vaccinia group.—[J. E. Prier, R. M. Sauer, R. G. Malsberger, and J. M. Sillaman: *Studies on a Pox Disease of Monkeys. II. Isolation of the Etiologic Agent*. *Am. J. Vet. Res.*, 21, (March, 1960): 381-384.]

Autoradiographic Studies of Bovine Leukocytes

Tritium-labeled thymidine was used *in vitro* for microautoradiographic studies of the leukocytes of normal and leukemic cattle. The mean labeling percentage of the mononuclear cells of normal bovine blood was 1.03 ± 0.13 . Three cattle, 2 suspected leukemic and 1 leukemic, had significantly higher labeling: 1.49, 3.84, and 3.18 per cent, respectively. From these findings, it was sus-

pected that the mononuclear cells of cattle with lymphocytic leukemia, although morphologically normal, may be dissimilar.—[J. J. Kaneko, W. S. Tyler, G. H. Theilen, and O. W. Schalm: *Autoradiographic Studies of Normal and Leukemic Bovine Leukocytes*. *Am. J. Vet. Res.*, 21, (March, 1960): 230-232.]

Treatment for *Cooperia punctata* in Calves

Twelve different species of helminths were found in 4 groups of 4- to 12-month-old beef and dairy calves raised in Hawaii. Of these, *Cooperia punctata* was found to be the most numerous. It is believed that this parasite contributes to the unthriftiness often seen in local calves, especially those raised in areas of high rainfall. Of the 2 groups of beef calves examined, the number of *Cooperia* was greater in those 8 months old. In the dairy calves, the parasite count was highest in 4-month-old animals in 1 group, and 8-month-old animals in the other group. It is suggested that beef calves be treated against *Cooperia* at the age of 7 to 8 months and dairy calves at the age of 4 to 8 months, as needed.

Of various drugs critically tested against *C. punctata* infection in calves, the piperazines and Ruelene (a new organic phosphate compound) yielded better results with respect to combined efficacy against the parasite and tolerance of the animals to the drug. Piperazine dihydrochloride at the rate of 20 Gm. of base/100 lb. of body weight and Ruelene at the rate of 1.76 Gm. of active ingredient/100 lb. of body weight were found to be, on the average, 87.8 per cent and 99.7 per cent effective, respectively, against *C. punctata*.—[J. E. Alicata: *Incidence of Parasites in Calves in Hawaii and the Treatment of *Cooperia punctata*, with Special Reference to the Efficacy of Ruelene*. *Am. J. Vet. Res.*, 21, (May, 1960): 410-415.]

Nematode Egg Counting in Cattle and Sheep Feces

In a comparative study of fecal samples from 78 cattle and 13 sheep, the McMaster dilution technique was found to be far superior to the direct centrifugal flotation (dcf) technique for counting nematode eggs. In a series of 13 sheep, the average egg count obtained by the dcf technique with Sheather's sugar solution as the flotation fluid was 11 per cent of that obtained by the McMaster technique. In 4 series of 15, 24, 26, and 13 cattle, respectively, the average egg counts obtained by the dcf technique with Sheather's sugar, 33.1 per cent zinc sulfate, saturated zinc sulfate, and saturated sodium nitrate solutions ranged from 22 to 56 per cent of those obtained by the McMaster technique. In a series of 13 cattle, direct egg counts made by counting every egg in 0.1-gm. fecal samples averaged 92 per cent

of those obtained by the McMaster technique. The differences between the results obtained by the McMaster and dcf techniques were significant far beyond the 0.1 per cent level, but differences between the results obtained with different flotation solutions or between the McMaster and direct count techniques were not significant at the 5 per cent level. It is concluded that, for valid comparisons of fecal egg counts, a standard counting technique must be used, and the McMaster technique is considered best because of its speed and accuracy.—[N. D. Levine, K. N. Mehra, D. T. Clark, and J. Aves: *A Comparison of Nematode Egg Counting Techniques for Cattle and Sheep Feces*. *Am. J. Vet. Res.*, 21, (May, 1960): 511-515.]

New Books

Control of Communicable Diseases in Man

This manual, prepared by the Subcommittee on Communicable Disease Control, American Public Health Association, provides reference for persons working in both human and veterinary medicine. It presents, briefly and factually, basis for management of communicable diseases, including zoonoses. The report covers infections occurring in all parts of the world, including

many less common diseases. Each disease is described regarding clinical nature, causes, effects, and methods of control.— [*Control of Communicable Diseases in Man, An Official Report of the American Public Health Association. 9th ed. 234 pages. American Public Health Association, 1790 Broadway, New York 19, N. Y. 1960. Price \$1.00, paper bound; \$2.50, cloth bound.*]

Animal Science

In this fourth and latest edition of this comprehensive work dealing with many aspects of production and marketing of farm livestock, several new sections have been included to bring to the reader's attention several recent innovations in agriculture. A section on automation and integration has been added. A section on agribusiness, which refers to the sum total of all operations connected directly or indirectly with agriculture, is devoted to modern production operations, storage, processing, and distribution of farm commodities, and the manufacture and distribution of farm sup-

plies. Another section deals with changes in livestock production that have occurred in recent years. Livestock marketing, present and future, is discussed and comments on livestock research are included. The book is well written and conveniently indexed and should serve adequately as a general text and reference manual. Illustrations are not of high quality. — [*Animal Science. By M. E. Ensminger. 4th ed. 1,168 pages; 653 illustrations. Interstate Printers and Publishers, Inc., Danville, Ill. 1960. Price \$8.95.*]

Merck Index

The new seventh edition of the Merck Index of Chemicals and Drugs contains about 1,600 pages of text covering nearly 10,000 descriptions of individual substances, more than 3,300 structural formulas, and about 30,000 names of chemicals and drugs alphabetically arranged and cross-indexed.

It includes extensive scientific advances made during the past 8 years.

A feature of the book is a separate and greatly expanded cross-index section of more than 30,000 names. This enables the user of the book to locate a particular chemical description by page number, regardless of whether he knows only the generic name, brand name, or systematic chemical name for a substance.

A special section lists more than 400 organic "name" reactions with original and

review references, together with a description and structural representation of each reaction. There is an up-to-date periodic table arranged in accordance with the latest concepts of nuclear science, a table of international atomic weights, and close to 300 pages of appendixes on such subjects as chromatographic adsorbents, calories in foods, Russian alphabet, biological units, coal-tar colors, thermometric equivalents, antifreeze mixtures, refractive index of liquids, saturated solutions, radioactive isotopes, percentage solution tables for apothecaries, isotonic solutions, and atomic weights and their multiples and logs. — [*Merck Index of Chemicals and Drugs. 7th ed. Publications Department, Merck & Co., Inc., Rahway, N.J. 1960. Price \$12.00.*]



News

1960 AVMA Research Fund Campaign Returns Reported

A September tabulation showed that more than \$13,000 has been contributed to the AVMA Research Trust Fund in 1960. A series of direct mail appeals sent by AVMA early in the year to the profession, commercial companies, allied organizations, and others drew in most of the contributions.

Here's a breakdown of money received:

The profession in private donations	\$ 5,734.67
Commercial company donations	\$ 4,500.00
National, state, and local auxiliaries	\$ 1,460.00
Allied associations and groups	\$ 1,100.00
State and local V.M.A. chapters	\$ 610.00
Schools of veterinary medicine	\$ 75.00
TOTAL	\$13,479.67

Contributions, which are tax deductible, are turned over to the AVMA Council on research by the Fund trustees and used to support the AVMA Fellowship program. This program provides financial aid on a fellowship basis to veterinarians, enabling them to secure additional training for a career in research or teaching in any field within the broad bounds of veterinary medicine. Currently the program is supporting the work of 11 fellows.

Fund-raising plans for the balance of 1960 call for continuing appeals to commercial organizations for contributions.

In 1961 there will be several campaign programs. Early in the year there will be a direct solicitation of funds by Women's Auxiliary members from AVMA members. This program will be followed by appeals

to interested groups outside the profession. It is hoped that the campaigns will build the Research Fund revenue so that the number and size of stipends granted can be increased.

Cooperation Is the Keyword for Humane Societies—Veterinary Profession

Humane societies and the veterinary profession must learn to work together toward its mutual goal of animal well-being, each filling their own important role in providing animal care, Dr. H. E. Kingman, Jr., AVMA executive secretary, told humane association representatives at their annual meeting in Chicago, September 26-28.

Dr. Kingman pointed out that the 84-year history of the American Humane Association shows a "resolute determination to improve the attitude of human beings toward dumb animals." The history of the veterinary profession shows an "equally resolute determination to improve the health and well-being of animals and man."

"It is my hope that a better understanding of how humane societies and veterinary associations can help each other in this important work can be brought about," Dr. Kingman said.

TOWARD BETTER RELATIONS

"In 1928, our two associations developed a memorandum of understanding to govern the relations between humane organizations and veterinarians. It was based on mutual respect and appreciation for our respective roles in society. Two years ago, the associations slightly revised the memorandum, making modifications that both groups felt were necessary.

"It attempts to guide the individual interested in the humane movement away from

the pitfalls he will encounter when attempts by humane groups are made to render veterinary services. It urges the veterinarian and the local veterinary society to recognize the responsibilities of humane societies in the enforcement of the law against cruelty to animals. Its greatest purpose is to encourage individuals to sit down with each other and resolve differences in light of public interest.

"This is a memorandum of understanding that we hope will serve as a starting point at the local level for continuing cooperation and assistance," Dr. Kingman said.

HUMANENESS IS EDUCATION

He said that "Humaneness is education," and that action programs are a most important part of education. However, he warned that care should be taken that the action programs do not carry humane associations into the field of veterinary practice.

"When this happens, humane associations find that within the structure of their organization and its personnel it is impossible to render high quality veterinary medical service and that they are alienating the very groups they most need for their programs to succeed."

PUBLIC IMAGE PRESENTED THROUGH MEMBERSHIP

Dr. Kingman said that he recognized the limitations of associations in "policing" their memberships. "However," he said, "too frequently we fail to exercise our prerogative to invoke restraints, vigorously and promptly, against individuals who illicitly identify themselves with either of our organizations."

"The image that humane associations would like to present to the public is, of course, one of a competent, professional organization performing a useful community service. The picture we like to present of the veterinarian is one of high standards of ethics, maximum public service, and modern professional training. Unfortunately, there are some in each group who do not deserve this recognition, and to the extent that either group fails to achieve its intended purpose, problems arise."

"If we permit small radical elements to parade under our banner, then the solid citizen we need to work on our projects, the scientist no matter how dedicated to the cause of human and animal welfare, and the philanthropist who wishes to support a worthy program, all will be reluctant to join with us and cooperate wholeheartedly."

"As we move ahead in our efforts to expand and intensify cooperation, let us make sure that the full benefits of humane society-veterinary relationships are realized in terms of public interest," Dr. Kingman said.

Two Veterinarians Participate in AMA Rural Health Conference

Two veterinarians appeared on the program of the First Regional Conference on Rural Health, southeastern states, sponsored by the American Medical Association, October 7-8, in Atlanta, Ga.

Martin P. Hines, D.V.M. (OSU '46) represented AVMA at the meeting and took part in a panel discussion entitled "Safety—Home, Work, Play." James Lieberman, D.V.M. (MID '44), assistant chief of the training branch of the Communicable Disease Center in Atlanta, spoke on "Animal Disease and Human Health."

The two-day conference, presented through the cooperation of AMA, state medical societies, national farm groups, agricultural leaders, and allied health organizations had a general theme of "Joining Hands for Community Health." Some topics discussed during the sessions were "Your Community and Preventable Diseases," "Health Opportunities Through Organized Community Development Groups," and "Immunization, Why and How."

Australian Veterinary Association President Visits AVMA

The president of the Australian Veterinary Association, Dr. D. S. Wishart, visited the AVMA central office in Chicago, September 26.

Dr. Wishart is visiting many countries around the world to study the use of hormones in animal production. He came to the United States from Buenos Aires where he attended a veterinary symposium on this subject. Before returning to Australia, he will stop in London, Rome, and Singapore. This is his second trip to many countries of the world.

In Australia, besides serving as president of the AVA, Dr. Wishart is a senior veterinary research officer for Australia's Department of Agriculture. His home is in Victoria.



Dr. D. S. Wishart

Dr. Wishart told the AVMA staff that about 60 per cent of Australia's 850 veterinarians are in private practice. Fifteen years ago, only 25 per cent were in private practice, and only one fifth of these veterinarians maintained rural practices. He said Australia plans to open its third veterinary school in the near future.

He pointed out that veterinarians direct 10 to 20 per cent of the activities of Australia's Department of Agriculture and that Australian veterinarians feel the separation of problems of animal production from problems of animal disease in America is perhaps too extreme.

Comparing the organizational structures of the American Veterinary Medical Association and the Australian Veterinary Association, Dr. Wishart said that the six state societies in Australia are divisions of the AVA. The veterinarian wishing to join the AVA applies for membership to his state association. His application is forwarded to the national society; the state society then elects him as an AVA member.

Small Business Administration Grants Two Veterinary Loans

The Washington Report on Medical Sciences reports that 26 of 539 loans approved by the Small Business Administration in June went to individuals and enterprises in the field of health care. One of the 26 receiving loans was a veterinary group in

Scottsbluff, Neb., which received \$21,500. Ten of the 26 loans, a total of \$78,400, went to dentists.

In July, a veterinary hospital in Lakeview, Ore., received a loan of \$20,000 from the Administration. This was one of nine loans approved that month for profit-making enterprises in the health field.

Dr. E. R. Price Named Public Health Veterinarians President

Dr. E. R. Price (AUB '37), public health veterinarian, Missouri Department of Public Health and Welfare, Jefferson City, was named president of the Association of State and Territorial Public Health Veterinarians at its meeting in Atlanta, Ga., September 12-17.



Dr. E. R. Price

Other officers are Drs. Joseph D. Salisbury (OSU '42), public health veterinarian, Indiana Department of Health, Indianapolis, vice-president; and Oscar Sussman (MSU '40), public health veterinarian, New Jersey State Department of Health, Trenton, secretary-treasurer.

An honorary life membership was awarded to Dr. L. E. Starr (OSU '13), public health veterinarian, Georgia Department of Public Health in recognition of his outstanding work in the field of veterinary public health.

A Committee on Comparative Medicine was formed at the meeting to study the need for research in the field of comparative medicine and the ways such research might be accomplished. Committees were also ap-

pointed to encourage reporting occurrence of diseases of animals transmissible to man and to make recommendations for quarantine of dogs and others animals being imported into the country.

Dr. J. C. deHoll Transferred to Washington, D.C.

Dr. John C. deHoll (ISU '38) has been transferred to Washington, D.C., and promoted to the position of chief staff officer for procedures and training of the USDA Meat Inspection Branch. He was formerly inspector in charge of the Sioux City, Iowa, meat inspection station, USDA, since 1957.



Dr. John C. deHoll

Dr. deHoll became a meat inspector at Birmingham, Ala., in 1943. He also held assignments at Chattanooga, Tenn.; Smithfield, Va.; and Indianapolis, Ind.

USDA Task Force Named to Study Smoked Meat Requirements

A task force of USDA personnel has been named to review the federal meat inspection requirement that the weight of smoked meat products must not exceed the products' weight before treatment.

Most smoked meats are prepared with curing solutions which increase their weight before being smoked. Under the federal requirement the smoking and drying process must bring these products back to their original weight. Some smoked meats covered

by the requirement are hams, pork shoulders, pork shoulder picnics, pork shoulder butts, and beef tongues.

USDA officials feel the review is needed because of modern consumer preferences for milder smoked meats, modifications in meat smoking facilities, and the acceptance of phosphates for use in meat-curing solutions.

Everyone interested in the review has been requested to submit his comments and supporting information in writing to the director of the Meat Inspection Division, Agricultural Research Service, USDA, Washington 25, D.C., before November 15.

Dr. W. H. Bassett Receives New USDA Appointment

Dr. William H. Bassett (ISU '35) has been promoted to the position of inspector in charge, Sioux City, Iowa, meat inspection station, USDA.



Dr. William H. Bassett

Dr. Bassett went to Sioux City from Ottumwa, Iowa, where he was inspector in charge since January, 1957. He entered the meat inspection service in May, 1937, and has served at Omaha, Neb., and Allentown, Pa.

Dr. G. O. Johnson Promoted

Dr. George O. Johnson (COL '48) has been promoted to the position of assistant chief staff officer, Veterinary Biologics Licensing, Animal Inspection and Quarantine Division of the Agricultural Research Service, USDA, in Washington, D.C.



Dr. George C. Johnson

Dr. Johnson served with the USDA in the Foot-and-Mouth Disease Commission in Mexico and the Veterinary Biological Products Inspection in Berkeley, Calif., and Omaha, Neb. He transferred to Washington, D.C., from Omaha where he had served as inspector in charge since 1957.

Dr. R. P. McCoy Transferred to Nebraska

Dr. Robert P. McCoy, Jr. (TEX '48), has been transferred from the Program Development and Service Staff of the Meat In-



Dr. Robert P. McCoy, Jr.

spection Division, USDA, in Washington, D.C., and promoted to assistant inspector-in-charge position at Omaha, Neb.

Dr. McCoy has been a member of the Washington staff since July, 1958. He entered the meat inspection service at Denver, Colo., in 1958. He was detailed to the Atomic Energy Commission at Mercury, Nev., to participate in the Fallout Study Program, and became a member of a training team which was honored with a Superior Service Award this year.

Among the States and Provinces

Hawaii

HAWAII V.M.A. HOLDS ANNUAL MEETING.—New officers elected at the annual meeting of the Hawaii Veterinary Medical Association, Sept. 3, 1960, are: Dr. N. Y. Chung, Honolulu, president; Allen Miyahara, vice-president; and K. S. Ishimoto, Honolulu, secretary-treasurer.

Dr. Walter R. Hass presented a report on the AVMA convention at the meeting. Dr. Howard Furumoto reported on the Small Animal Hospital Association meeting.

Iowa

ISU'S VETERINARY ANATOMY DEPARTMENT WINS SWEEPSTAKES.—The Veterinary Anatomy Department at Iowa State University won the sweepstakes trophy at the University's Veishea Open Houses.

The Department's exhibits on "Neuroanatomy" won first place not only in competition with the University's five colleges but also with the 72 departments.

The Veterinary Anatomy Department also took first prize in the College of Veterinary Medicine competition, but because only one trophy can be won by a department, the Veterinary Physiology and Pharmacology Department was awarded the College of Veterinary Medicine first prize trophy.

The exhibit, set up by freshmen veterinary students, emphasized the role of the nervous system in the animal body. This was done

by means of dissection as well as the use of microscopes with slides of nerves, brain, spinal cord, and other appropriate areas of animals' bodies. The exhibit was viewed by 4,405 people in the two days it was shown.

This is the second time in three years the Veterinary Anatomy Department has been the sweepstakes winner. It also took the award in 1958.

Kentucky

NEW OFFICERS ELECTED.—New officers were elected by the Women's Auxiliary to the Kentucky V.M.A. when it met in conjunction with the 49th annual meeting of the Kentucky V.M.A. in July.

The new officers are: Mrs. Howard White, Lexington, president; Mrs. Charles Eastin, Lexington, first vice-president; Mrs. Abe Allen, Paducah, second vice-president; Mrs. W. E. Bowley, Crestwood, secretary; Mrs. Robert Needham, Campbellsville, treasurer.

Nevada

DR. W. F. FISHER NEW NEVADA STATE DEPARTMENT EXECUTIVE OFFICER.—Dr. W. F. Fisher (COL '23) was appointed executive officer and state quarantine officer by the Board of Stock Commissioners, Nevada State Department of Agriculture, late in May.

Dr. Fisher began his career in Nevada as an employee of the USDA. He worked in the control, regulation, and eradication of livestock diseases until Jan. 1, 1957, when he became director, Division of Animal Industry, Nevada State Department of Agriculture. Dr. Fisher will continue to hold this position in addition to his new duties.

New Jersey

PROFESSIONAL PERSONALITY DISCUSSED AT NORTH WEST JERSEY MEETING.—The importance and responsibility of a professional man in his community was discussed by Dr. Robert R. Shomer (UP '34), secretary-treasurer of the New Jersey State Board of Veterinary Medical Examiners, at the July 20, 1960, meeting of the North West Jersey Veterinary Society.

"A profession is not merely a business or

a way of earning a living. It is a form of public service based on expert knowledge . . . and maintained by approved standards of performance. A professional man enjoys great prestige, status, and even privileges, but he must earn them through service," Dr. Shomer told the group.

Pointing out the importance of boards of examiners and professional ethics to a profession, Dr. Shomer said, "The profession as a whole is responsible for the competence of its members and this can only be maintained through the medium of regulatory boards. Such boards of examiners are rightfully members of the profession who best understand its needs and problems."

"Professional ethics should be promoted by professional associations. The standards and code of ethics then have a broad base established from many points of view."

Speaking more specifically to the New Jersey group, Dr. Shomer said, "The relatively few violations of the New Jersey State Veterinary Practice Act, either by veterinarians or by the occasional illegal practitioner, is due solely to the competence and high standards of performance by the veterinary profession within this state."

North Carolina

NORTH CAROLINA VETERINARY RESEARCH FOUNDATION AWARDS TWO GRANTS.—Two research grants in the field of parasitic research have been awarded by the North Carolina Veterinary Research Foundation, Inc.

One grant went to the Bowman Gray School of Medicine for a study of "Host-Parasite Relationship" (basic parasitic research). The study will be performed by Drs. T. B. Clarkson (GA '54) and John LeMay (GA '59).

The other grant was awarded to Dr. E. G. Batte (TEX '49), head of the veterinary section of North Carolina State College, for a study of parasites in cattle.

The North Carolina Veterinary Research Foundation was established two years ago by the North Carolina V.M.A. to raise money for further research and education in animal diseases. The initial funds for the foundation were raised by the North Carolina V.M.A. auxiliary through a "white elephant" sale of discarded veterinary equipment. Most of the money for the foundation has been raised within the veterinary profession.

NORTH CAROLINA V.M.A. HEARS DR. SCHEIDY.—The North Carolina V.M.A. heard an address by Dr. Samuel F. Scheidy, then president of the AVMA, entitled "Why Stand Alone?" at their 59th Annual Meeting, June 21-23, 1960, in Asheville.

Other guest speakers on the program were Drs. L. E. Harris, director, Pharmaceutical Division, Norden Laboratories, Inc., Lincoln, Neb.; H. W. Kinard, Bamberg, S.C.; R. L. Lundvall, professor, veterinary medicine and surgery, Iowa State Veterinary College, Ames, Iowa; and R. B. McClland, Buffalo, N.Y.

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TWIN CAROLINAS V.M.A. ELECTS NEW OFFICERS.—New officers of the Twin Carolinas Veterinary Medical Association are: Drs. S. A. Alexander (OSU '16), Monroe, president; W. M. Lewis (GA '57), Lumberton, vice-president; and J. E. Currie (GA '55), Southern Pines, secretary-treasurer.

s/J. E. CURRIE, *Secretary*

Ohio

OHIO STATE UNIVERSITY HONORS 75-YEAR-OLD ALUMNI AT 75TH ANNIVERSARY.—As part of the 75th anniversary celebration of the College of Veterinary Medicine, Ohio State University honored the seven veterinary alumni who had passed their 75th birthday. They are: Drs. Bruce H. Edging-



Dean W. R. Krill, of the College of Veterinary Medicine, Ohio State University (left), presents citations at the 75th anniversary celebration. Shown left to right are: Drs. George W. Gillie, Frederick Heimberger, vice-president, OSU, James D. Grossman, Bruce Edgington, and Fred Zimmer.

ton ('12), Paul Fischer ('92), George W. Gillie ('07), James D. Grossman ('14), Arthur F. Schalk ('08), John H. Rietz ('03), and Fred A. Zommer ('09). Four were present to receive their citations.

Oregon

WILLAMETTE V.M.A. ELECTS NEW OFFICERS.—New officers of the Willamette V.M.A. are: Drs. M. M. Corff (CAL '53), McMinneville, president; E. R. Derflinger (OSU '15), Salem, vice-president; and E. L. Henkel (WSU '36), Silverton, secretary-treasurer.

s/E. L. HENKEL, *Secretary*

Pennsylvania

CONFERENCE ON DISEASES OF FARM ANIMALS HELD BY UNIVERSITY OF PENNSYLVANIA.—The Second Demonstration Conference on Diseases of Farm Animals in Pennsylvania, sponsored by the School of Veterinary Medicine of the University of Pennsylvania, was held Sept. 22, 1960, at the school's New Bolton Center near Kennett Square, Pa.

Four research presentations were given, each dealing with a specific disease or with an area of animal physiology in which investigators are seeking more comprehensive understanding of the laws governing the animal's life during health and illness. Following presentations by veterinarians, workers from the School of Medicine commented on related research in the field of human medicine.

Subjects of the four research presentations were: leptospirosis research, the milking machine and its relation to mastitis, effects of newer drugs on farm animals, and protein metabolism in sheep.

Quebec

MONTREAL V.M.A. MEETS.—The two guest speakers at the May meeting of the Veterinary Medical Association of the Province of Quebec, Montreal region, were Drs. Jean-Paul Morin, veterinary inspector, Health Department, and Andre Bohuan, veterinary director, Rogar Company, Ltd., St. Hyacinthe. The meeting was held at the University Circle in Montreal.

Dr. Morin discussed the relationship of the veterinarian to the milk producers. He emphasized the role of the veterinarian in preventing bovine diseases, especially mastitis.

Dr. Bohuan talked about new clinical and therapeutic approaches to bovine diseases such as acetoneemia, hypocalcemia, and grass tetany.

Washington

NEW OFFICERS FOR WASHINGTON STATE V.M.A.—Dr. Robert Burch (WSU '43), Seattle, was installed as president of the Washington State V.M.A. at its annual meeting Aug. 29-30, 1960. Other association



Dr. Robert Burch, new Washington State V.M.A. president.

officers are: Drs. Howard Dubois (WSU '44), Burlington, president-elect; Orin Swanson (WSU '51), Vancouver, treasurer; Ernest Stone (WSU '42), Pullman, past-president.

Dr. Chet Griffith (COL '50) Seattle, was elected to the AVMA House of Delegates, and Dr. Don Clarke (WSU '41), Friday Harbor, was elected alternate delegate.

Veterinary Military Service

Air Force Veterinarians Abroad Upgrade Health Standards

Air Force veterinarians in Greenland have controlled the spread of rabies; in Guam, have checked the spread of infectious hepatitis; and in the Azores of Portugal, have improved the quality of beef and milk and even saved a fighting bull.

Many Air Force veterinarians, stationed throughout the world, are working to raise the health standards of the countries in

which they are serving. Some of their work is part of their military mission; much of it is voluntary. These are just a few examples of the grass-roots achievements the Air Force Veterinary Service, under Colonel Robert R. Miller, is playing in President Eisenhower's people-to-people program.

In the area around Thule, Greenland, about half of the sled dogs died during the 1958-1959 winter from a "rabies-like" disease that has been infecting sled dogs in western and northern Greenland for the past 100 years. At the request of the Danish government, an American veterinarian and a Danish veterinarian studied the disease and instituted a vaccination program to bring Greenland's rabies problem under control (see *J.A.V.M.A.*, Aug. 1, 1960: 183).

In Guam, an Air Force veterinarian traced three cases of infectious hepatitis among U.S. airmen to a local village. Medical care was promptly given to infected villagers and the spread of the highly contagious disease was stopped.

Farmers in the Azores now sell over a million liters of milk a week, as well as many other dairy and meat products, to the Air Force. But ten years ago, the Air Force bought a very small amount of these products from them. Purchases increased because of a program begun in 1949 by Air Force veterinarians to improve local milk-processing methods and the quality of local cattle. The program was financed by the local community; the veterinarians provided the education.

A bull and his progeny now carry the name of an Air Force veterinarian into Portugal's bullfight arenas. The bull had been gored by another bull and was dying. The veterinarian performed emergency surgery and saved his life. The grateful owners named the bull after the veterinarian.—*Army, Navy, Air Force J.*, Aug. 6, 1960.

Foreign News

U.N. Gives Emergency Allocation to Fight African Horse Sickness

ROME.—An emergency allocation of \$107,000 has been made by the U. N. Food and Agriculture Organization to combat African horse sickness which is spreading through parts of the Near East and India.

The use of contingency funds has been authorized by the U.N. Technical Assistance Board. This will enable the Organization to help countries like Turkey, India, and Pakistan to start producing their own supplies of vaccine. It is hoped that laboratories in these countries will produce cheap and plentiful supplies of vaccine for other afflicted countries.

Some emergency requests for vaccines have been met but hundreds of thousands of doses will be needed before the epizootic is under control.

Dr. N. R. Reid, FAO veterinarian, said the ravages of the disease were appalling. "Along the Euphrates, it looked like a battlefield, with hundreds of dead animals floating

down the river and constituting a difficult hygiene problem."

He said it was apparent that deaths of horses, mules, and donkeys would total three times the 44,500 officially recorded, that direct losses could be assessed at \$5 million, and that indirect losses to agriculture are incalculable.

"What we must realize," he said, "is that when a peasant farmer loses his one horse or mule he has lost his entire means of cultivation. One vaccination that costs \$1.25 would save his animal."

Neighboring countries have been warned of the possibility of the disease spreading to their animals. It is generally spread by biting insects.

Hospitality?

KENYA, AFRICA.—The East African Veterinary Research Organization at Mugua



Dr. DeTray sits proudly on the Mugua Estate visitor he killed.

Estate killed a visitor last summer. But he wasn't a friendly one—in fact, he was a killer, himself. He was a young male lion that strayed onto the estate and killed experimental cattle on three successive nights.

The Kenya Game Department decided the lion had to be shot, so on the fourth night two game wardens and two of the research staff lay in ambush near the lion's last kill. By 2 a.m. when the lion did not come calling, everyone gave up and left the ambush.

But Dr. D. E. DeTray, a veterinarian and head of the Cooperative Research Project of the USDA Animal Disease and Parasite Research Division, decided he'd look around the estate once more before retiring. He spotted the estate's visitor and killed him with a brain shot.

Deaths

Star indicates member of AVMA

F. P. Miller (KCV '18), 65, Kansas City, Kan., died July 17, 1960.

Before his retirement three years ago, Dr. Miller had served as a veterinarian for the U. S. Bureau of Animal Industry for 40 years.

★**Stephen A. Selby** (NYA '08), 86, Washington, D.C., died May 31, 1960.

Dr. Selby was a retired veterinary inspector.

Kourncess K. Shott (GR '17), 67, a general practitioner from Buhl, Idaho, died Aug. 14, 1960.

Dr. Shott was employed by the USDA in the Magic Valley, Idaho, area. He was a member of the Idaho State Board of Examiners for Veterinary Medicine. He served two years as president of the Northwest Veterinarian Medical Association and the Idaho Veterinarian Medical Association. His son, Dr. Leonard D. Shott (COL '59) is also a veterinarian.

Carl F. Stroehlein (USC '23), 69, a retired veterinarian and Federal inspector died in Miami, Fla., April 12, 1960.

William A. Swain, 88, Decatur, Ill., died July 22, 1960.

Dr. Swain had practiced at Mount Pulaski for 25 years and in recent years operated a real estate agency.

French T. Trout (DET), 74, Spencer, W. Va., died of a heart attack July 29, 1960.

Dr. Trout was president of the West Virginia V.M.A. for the past ten years.

E. R. Trull (KSU '31), 59, Bern, Kan., died June 20, 1960.

Dr. Trull had practiced in Bern for 28 years. He died of a heart attack.

E. B. Ward (CVC '01), died May 25, 1960, in Jefferson City, Mo.

Dr. Ward had practiced briefly at Fulton, Mo., and had served most of his life as an assistant state veterinarian with the Missouri Department of Agriculture. In over 40 years of service, he served under six state veterinarians. Dr. Ward was one of the veteran leaders of the profession in Missouri and was granted a lifetime membership in the Missouri V.M.A. in 1953. His late brother, Dr. H. C. Ward, was also a veterinarian.

Carr R. Webber (ONT '01), 87, of Rochester, N.Y., died Aug. 8, 1960.

Dr. Webber did graduate work at Chicago Veterinary College after receiving his D.V.M. degree. He was an original partner in the 62-year-old Webber Brothers Hospital and a veterinarian for 54 years. Dr.

Webber retired eight years ago. His brother, Dr. LeRoy Webber, is also a veterinarian.

Clarence W. Webber (COR '14), 76, Rochester, N.Y., died July 11, 1960.

Dr. Webber was a retired veterinarian and former vice-president and treasurer of Webber Brothers Hospital Inc., which he operated with his cousin, Dr. Orrin Webber.

Louis C. Webster (COR '15), 68, Canandaigua, N. Y., died May 3, 1960.

For almost 30 years he was Ontario County veterinarian. During this period, he developed one of the most thorough cattle-testing programs in the state. Following his departure from this post in 1954, Dr. Webster was associated with dairy and dry milk production firms for two years. Recently he had been serving with the U.S. Department of Agriculture, Federal Inspection Service, at the Emerson Produce Plant in Middlesex, N.Y.

A. R. Werring (KCV '17), Springfield, died June 20, 1960.

Dr. Werring started his practice in Comfrey, Minn., and moved to Springfield in 1920. He was honored in January, 1960, by the Minnesota State Veterinary Medical Society.

***Fred B. Worster** (OSU '59), 29, Columbus, Ohio, died June 10, 1960, from diabetes.

***Roy F. Zook, Jr.** (ISU '38), 43, Barrington, Ill., died of a heart ailment July 6, 1960.

Dr. Zook was owner of the Zook Animal Hospital which he ran in association with Dr. Jack Noyes (ILL., '59) since last September. After receiving his D.V.M. degree, he worked for the Anti-Cruelty Society in Chicago and at the Bremer Animal Hospital.

In February, 1942 Dr. Zook joined the Army as a lieutenant. During his four years of service, he was meat and food inspector and was the station veterinarian at a number of his assignments. He was discharged with the rank of major. After the war, he returned to Barrington and resumed his practice.

Women's Auxiliary

The First Year at the Office

In one year, the Women's Auxiliary to the American Veterinary Medical Association has set up and financed the operation of an Auxiliary office, laid the groundwork to change from a manual to an IBM membership record keeping system, integrated Auxiliary duplicating services, and established a liaison with the central office staff of the AVMA.

The Auxiliary office was set up in September, 1959, at the AVMA central office, 600 S. Michigan Ave., Chicago, Ill. The primary purpose of the office was to centralize the maintenance of membership records for the Auxiliary's 7,500 members.

When the office was first set up, the detailed duties of membership record-keeping were far too voluminous for the membership secretary to handle, even with the aid of a clerk. So Mrs. Lavina Davenport, LaGrange, Ill., was asked to help and later was appointed office supervisor by the Auxiliary's Executive Board.

The Auxiliary soon realized the efficiency and savings that would result from changing the membership record keeping from a manual to an IBM system and, at their Denver meeting last August, the change to an IBM system was approved. With the help of Mr. Russell G. Rongren, AVMA business manager, Mrs. C. M. Rodgers, Blandinsville, Ill., and Mrs. Davenport, the auxiliary's IBM system should be in operation by Dec. 15, 1960. The services of the clerk have been discontinued because the IBM system will lighten the office workload.

The new IBM membership cards will carry the name, address, type of membership held in the Auxiliary, year membership began, dues payment record, and membership number corresponding with the member's husband's membership number in the AVMA. Billing, which has formerly been staggered throughout the year, will eventually be handled once annually in April. Dues will continue to come in to the Auxiliary office and will be banked and made available to the Auxiliary treasurer.



Mrs. Bogue, Mrs. Kansas, 1959, and Mrs. Nipko, Mrs. Utah, 1960, are served tea at the Women's Auxiliary reception during the convention.

Three Auxiliary Delegates Held State Titles

Mrs. Utah, 1960, Mrs. Kansas, 1959, and Mrs. Kentucky, 1958, were delegates to the Women's Auxiliary to the AVMA convention in Denver last August.

They are better known to auxiliary members as Mrs. Roy A. Nipko, Salt Lake City, Mrs. Utah, 1960; Mrs. Robert E. Bogue, Wichita, Mrs. Kansas, 1959; and Mrs. Horace Davis, Lexington, Mrs. Kentucky, 1958.

Another service provided to the Auxiliary through the office in the past year has been the duplication of 66,727 Auxiliary forms, notices, letters, cards, reports, statements, membership cards, remittance blanks, stationery and envelopes. More than 4,000 dues statements were addressed and mailed.

Auxiliary dues and membership honor roll requirement records are also maintained in the office and then forwarded to the vice-president for the House of Delegates. Reports on office activities are periodically sent to the Auxiliary Executive Board.

Having an Auxiliary member right in the central office of the AVMA makes an exchange of ideas between the Auxiliary and the AVMA staff just a little easier. Often Mrs. Davenport is asked to carry problems and ideas of the Auxiliary to the AVMA staff for advice, establishing a closer relationship between the Auxiliary and the organization it was set up to serve.

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Note: Milk from cows treated with FURACIN-penicillin Gel should be discarded or used for purposes other than human consumption for at least 72 hours after the last treatment.



References: 1. Kakavas, J. C.; Roberts, H. D. B.; deCourcy, S. J., and Ewing, D. L.: *J. Am. Vet. M. Ass.* 119:203 (Sept.) 1951. 2. Kakavas, J. C.: *Antibiotics Annual 1954-1955*, New York, Medical Encyclopedia, Inc., 1955, p. 323. 3. Jackson, R. A.: *A Program for Mastitis Control*, Read at the Second Regional Conference on the Nitrofurans in Veterinary Medicine, Madison, Wisconsin, May 28, 1959, pp. 23-26.

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WHAT IS YOUR *Diagnosis?*

Make your diagnosis from the picture below—then turn the page ►



Fig. 1—Radiograph of lower jaw of the Poodle. Notice tumor and absence of the first 2 premolar teeth on the right mandible.

History.—A black, male Standard Poodle, 10 years old, had a recurrent tumor measuring 1.5 by 1.5 by 1.5 cm. on the right mandible, involving the tissues just posterior to the canine tooth. The process was ulcerative, dark colored, soft, and bled when traumatized. Some months before this examination, the original lesion had been excised, along with the first and second premolar teeth. During this examination, a biopsy and a radiograph (fig. 1) were taken.

Here Is the Diagnosis

(Continued from preceding page)

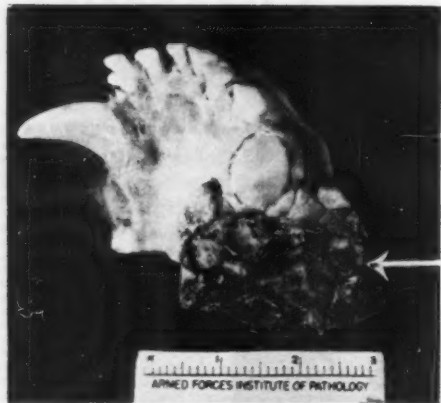


Fig. 2—Photograph of the Poodle's lower jaw. Arrow indicates tumor.

Diagnosis.—Malignant melanoma involving the mucous membranes, underlying tissues, and mandible of the right jaw (fig. 2 and 3).

Comment.—Euthanasia was advised and accepted. The records from approximately 125,000 dogs in one practice* indicate that malignant melanoma is rare. The non-malignant, pedunculated tumors of black-skinned dogs, on the other hand, occur frequently in animals over 7 years old. The highest incidence is in the black Cocker Spaniel. These tumors are benign, grow slowly, and do not recur when removed.

Malignant melanoma was diagnosed in only 17 instances: 12 in the oral cavity, 4 in the skin, and 1 in the eyeball. In the oral cavity, 8 occurred in the buccal gingiva adjacent to the teeth, 2 in the tonsil, 1 on the soft palate, and 1 on the tongue.

*Riser Animal Hospital, Skokie, Illinois

This case was presented by J. Raymond Currey, D.V.M., Washington, D. C., and was prepared with the assistance of Wayne H. Riser, D.V.M., M.S., Kensington, Md.

Fig. 3—Photograph of a cross section taken through the lesion and both rami of the mandible, showing (A) the tumor, (B) left first premolar tooth, and (C) canine teeth.

Research Trust Donation

The trustees of Smith, Kline and French Foundation, Philadelphia, Pa., have donated \$2,000 to support the AVMA Fellowship Program. The Program, administered by the AVMA Council on Research, now provides funds necessary for fellowship stipends of 11 graduate veterinarians in the disciplines of veterinary research and teaching.

Cattle Thrive on A-Range

A herd of cattle has grazed on the world's worst fallout area for 2 years with no ill effects, the Atomic Energy Commission re-

ported recently. At the scene of 93 atomic explosions since 1951, a herd now numbering 47 animals grazes the 600-square-mile Nevada Proving Ground. The herd has been maintained as a yardstick against any assertions by cattlemen of the surrounding areas that their stock has been contaminated. The Commission reported no obvious physiologic damage and no apparent genetic effect among 20 calves produced by the herd. An analysis of 19 slaughtered test animals indicated that only a normal amount of strontium 90 was present in their bones.—*Canad. J. Comp. Med. & Vet. Sci.*, 24, (June, 1960):194.

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REFERENCES: 1. Michaelson, S. M., and Covert, M.: J. Am. Vet. M. Ass. 134:334 (Apr.) 1959. 2. Mosier, J. E., and Coles, E. H.: Vet. Med. 53:619 (Dec.) 1958. 3. Bell-off, G. B.: Calif. Vet. 9:27 (Sept.-Oct.) 1956. 4. Coles, E. H., and Mosier, J. E.: Am. J. Vet. Res. 20:1020 (Nov.) 1959. 5. Mosier, J. E.: Vet. Med. 52:445 (Sept.) 1957.



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Fifty-five cattle affected with botulism were examined and urinalyses conducted on 17. All had indicanuria, 13 had albuminuria, and 6 had glycosuria. Glycosuria was observed especially in acute cases.—*Ankara (Turkey) Universitesi Vet. Fakultesi Dergisi*, 6, (1959): 8.

Sheep Implicated in Q Fever in Northwest

At the Rocky Mountain Laboratory, Hamilton, Mont., workers of the National Institute of Allergy and Infectious Diseases have investigated factors associated with a marked increase in Q fever in Idaho during 1958. The study, by Stoenner and associates, is reported in the *American Journal of Hygiene*.

During 1951, 20 cases of Q fever were found in Idaho. These occurred predominately in males and in persons having contact with sheep. During the period from 1951 to 1958, 131 persons were found to be infected. Most of the cases occurred in persons aged 20 to 69 years and only 9 per cent were in females. The majority of cases occurred during the months of March to June, during the lambing season. It was possible to demonstrate that sheep are infected with Q fever organisms but that the infection tended to be limited in time. Surveys of dairy herds conducted in 1951 indicated that less than 1 per cent of the herds were infected. An alarming increase in the number of infected dairy herds was detected in 1958, for 17 per cent of the herds were found to be infected.

These results indicated that Q fever has become a serious problem in the northwestern United States and that sheep and cattle are widely involved. While the epidemiologic data presently available indicate that human disease is most often contracted from sheep, the recent widespread increase of infection in cattle has built a potential reservoir of infection for man which must be reckoned with in the future.—*Highlights of Research Progress in Allergy and Infectious Diseases, 1959, U.S. Department of Health, Education, and Welfare, Public Health Service publication No. 745, Bethesda, Md., (1959): 49.*

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1. Friis, C.W.: About Life Restoration of Newborn in The General Practice, Jnl. of The Danish Assn. of Vet., Nos. 2-15, Jan. 1959.

History of the AVMA

At the 1897 meeting in Nashville, President F. H. Osgood called attention to some of the undesirable features of electing the president, *i.e.*, by nomination and a majority vote of those present at the meeting—following which the chair was turned over to the new president. Suppose a new president “is opposed to the

1897

Dr. Daniel E. Salmon, USVMA President from 1897 to 1898.

policy advocated in the annual address of the retiring president. Must a year be lost before the new party has opportunity to declare its policy,” . . . leaving only a day or two for action to be taken on his recommendations before another man is elected? Also: “. . . each member who desires to vote for the Association’s officers must pay for that privilege the exact sum which it costs him to leave his business . . . to travel . . . and support himself while absent.” He also suggests that voting rights should be invested in delegates from constituent associations to prevent a miscarriage of the will of the membership through the preponderance of “self-appointed” delegates from the region near the place of meeting. These objections, of course, were later recognized as valid.

Citing “the great help that will come to us

all from professional unity,” Dr. Osgood suggests “the desirability of changing the name of this Association to that of the National Veterinary Association of North America The professional and economic union between certain parts of the United States and British North America, is now as close, as far as our mutual interests are concerned as it is between one and another of our States.” This suggestion did result in a name change the next year, following the tabling of a resolution by A. W. Clement in favor of “The American Veterinary Medical Association.”

As Chairman of the Committee on Diseases, Theobald Smith notes that the stipulated function of the committee—“to investigate the character and extent of prevalent diseases throughout the United States,”—was in need of revision: “The need of the present is not diffusiveness but concentration upon some one theme, to give those who know something about it a chance to impart their knowledge . . . and those who do not know, the opportunity to listen.” As a matter of interest, Smith had been proposed for honorary membership some years earlier, but was refused because he was eligible for regular membership as a physician. At the Nashville meeting he resigned his active membership and was elected an honorary member of the Association.

Tuberculosis was again the major topic for discussion. J. M. Parker notes: “. . . there has been too great a tendency, among members of the profession, to look upon everything as secondary to the question as to whether a cow reacted to tuberculin or not the important question of wholesome milk . . . the value of cleanliness and light, ventilation and drainage . . . should receive greater attention . . . [but] I would not neglect tuberculin.” The ensuing discussion between Drs. Salmon, Pearson, Law, Cary and Lowe, all future presidents of the Association—would be of interest today to anyone engaged in tuberculosis eradication.

D. E. Salmon was elected president; Sescio Stewart, secretary; and W. H. Lowe, treasurer.

✦ ✦ ✦

DANIEL ELMER SALMON, D.V.M., was born at Mount Olive, N. J., July 23, 1850. He was graduated with a Bachelor of Veterinary

Continued on adv. p. 36.

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HISTORY—continued from adv. p. 34.

Medicine from Cornell University in 1872, and was awarded the D.V.M. in 1876 after clinical study in France. After investigating contagious diseases of animals for the USDA, he was called to Washington to organize what became the Bureau of Animal Industry in 1884. During the 21 years he served as its chief, pleuropneumonia and several outbreaks of foot and mouth disease were eradicated, the federal meat inspection system was inaugurated, the mode of transmission and methods for control of Texas fever were worked out, effective quarantine regulations for imported animals were promulgated, and much progress was made upon the control of hog cholera—in spite of the roadblocks imposed by his chief antagonist, F. S. Billings.

Dr. Salmon was never overly-popular in his pioneering role, and to defend the many attacks upon the BAI—mostly unwarranted—he felt forced to sacrifice much of the dignity that might have attended his important, but poorly appreciated, position. To his credit it can be said that he effectively dispelled doubts from within the veterinary profession concerning the validity of his work and that of other Bureau veterinarians—with the result that he was elected president of the USVMA in 1897.

Through no fault of his own, he was in effect “thrown to the lions” in the wake of sensational, but misdirected, charges concerning the meat inspection system, and broken in spirit, Dr. Salmon was removed from office in 1905. After five years in Uruguay, he returned to the U. S., where he died at Butte, Mont., Aug. 30, 1914.

★ ★ ★

FREDERICK H. OSGOOD, M.R.C.V.S., was born in Newton, Mass., April 16, 1857. He was graduated from the Massachusetts Agricultural College in 1878, after which he qualified in veterinary medicine at the Edinburgh Veterinary College. He served as lecturer on cattle pathology and later as professor of Veterinary Surgery at the Harvard University Veterinary School, and was a member of the State Cattle Commission during the early days of tuberculosis eradication. He was the prime mover in organizing the Massachusetts Veterinary Association in 1884, and served as its first president. Having served several terms as vice president of the USVMA, he was elected president of the Association for 1896-1897. During much of his professional life he conducted a high class veterinary practice. He died in Boston on Feb. 21, 1914.

Dr. Smithcors Needs Pictures of Early Veterinary Activities

Dr. J. F. Smithcors, author of this series, is eager to obtain early photographs (1925 or before) relating to the veterinary profession, for a pictorial archives of veterinary history. In particular, he needs pictures suitable for inclusion in his forthcoming book on the history of veterinary medicine in America. Especially needed are early pictures of veterinary schools, hospitals, meetings, operating scenes, noted men and the like. Programs of early AVMA, state and other meetings are also needed.

If you have anything of this nature, please contact Dr. Smithcors at the Anatomy Department, Michigan State University, East Lansing, Mich. Copies of anything you wish to keep will be made and the originals returned promptly. Please identify individuals and events as far as possible.

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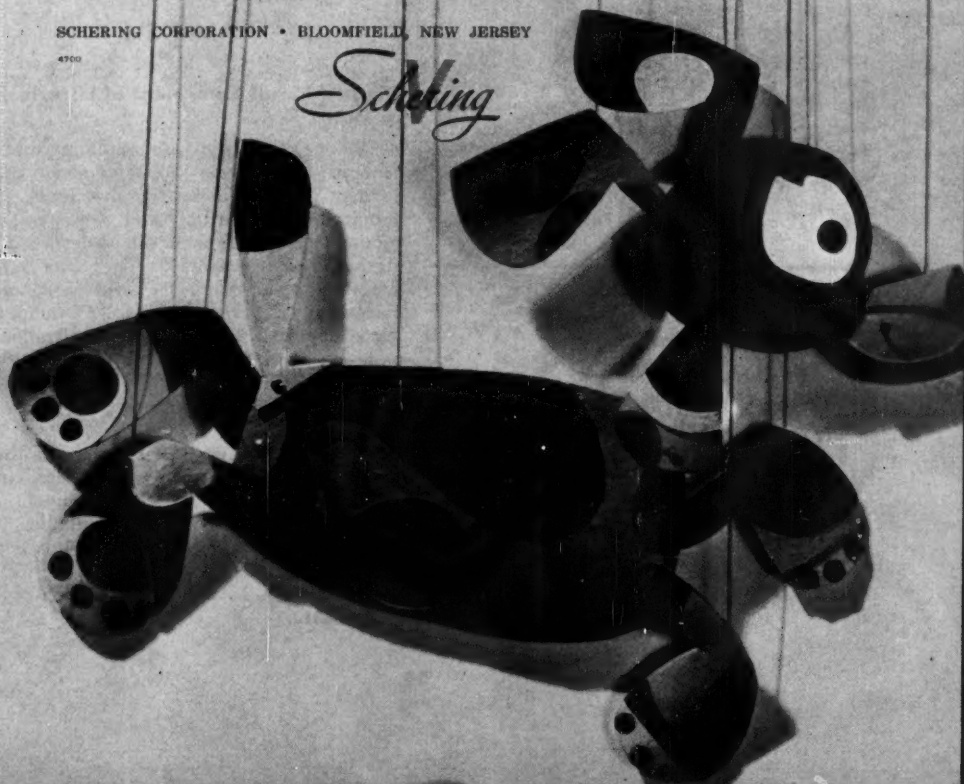
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Increase in Farm Production Opportunities for Veterinarians

Veterinarians who are prepared to meet the growing needs of agriculture face broader opportunities than ever before, Dr. Laurent Michaud of the Merck Sharp & Dohme Research Laboratories Division told mem-



Dr. Laurent Michaud

bers of the Canadian V.M.A. at their 1960 convention.

Dr. Michaud (MON '36) is manager of animal science nutrition research at the Rahway, N.J., laboratories of Merck & Co., Inc. He said new trends in farm production, with mechanization, specialization, and integration, have increased the need for veterinarians not only in practice, but also in every branch of research, in veterinary colleges, in medical schools, biological research

centers, government experiment stations, and industrial laboratories.

"There is a need for specialized veterinarians in applied nutrition, parasitology, bacteriology, pathology, and animal husbandry," he continued.

Dr. Michaud indicated that the use of feed additives as a method of disease prevention and control will become a tool of the veterinarian. He called feed medication an established procedure that is economically sound, practical, and useful. The veterinary profession does not object to the use of feed additives which are considered nutrients, such as proteins, carbohydrates, fats, vitamins, and minerals, he said. "... These very compounds may prevent or cure a multitude of diseases and abnormalities," and the advantages offered by the addition of growth stimulants and disease preventives to feedstuffs represent millions of dollars to farmers, Dr. Michaud pointed out.

A native of Nova Scotia, after receiving his D.V.M., Dr. Michaud worked in Canada for 12 years as a general practitioner, as director of the Quebec provincial experimental fur farm, and as a biochemist in the veterinary research laboratory in St. Hyacinthe, Province of Quebec.

Diagnosis and Treatment of Listeriosis in Man

Evidence has been accumulating that infections by *Listeria monocytogenes* (meningitis, granulomatosis of the fetus, conjunctivitis, urethritis, and infectious mononucleosis) in man are widespread but frequently unrecognized. The chief reason for missing the diagnosis is the morphologic resemblance of the organism to nonpathogenic diphtheroids which are common as skin contaminants.

Seen in direct smears of spinal fluid, *L. monocytogenes* often look more like cocci than bacilli.

In vitro sensitivity tests indicated that 7 strains of *Listeria* were sensitive to chloramphenicol, tetracycline, erythromycin, and penicillin. For treatment, penicillin was given in all cases, together with either chloramphenicol or a sulfonamide, usually sulfadiazine. — *J. Am. M. A.*, 171, (Nov. 7, 1959): 1319.



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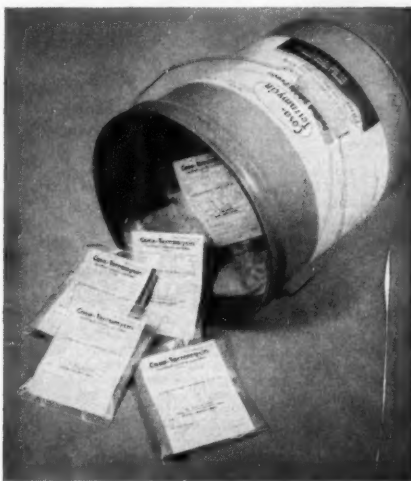
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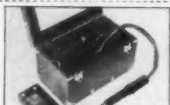
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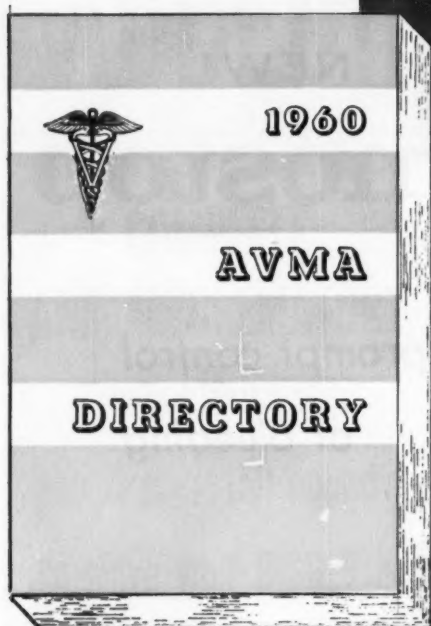
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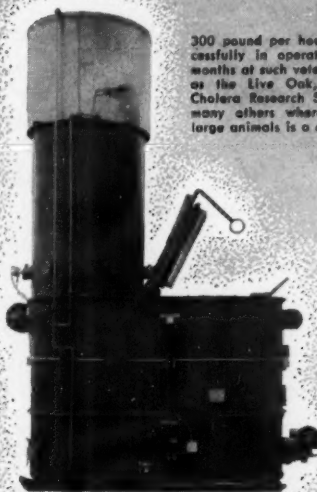
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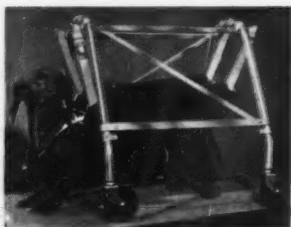
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Quiz for Quidnuncs

1. In cattle what sequelae to shipping fever and initial grain feeding may result in feedlot bloat? Page 505.
2. A congenital cyclopic type of malformation in lambs was believed due to what nonhereditary causes? Page 521.
3. What technique has been shown to be extremely accurate in determining pregnancy in mares? Page 524.
4. How long will antibiotic residues persist in milk of cows treated for mastitis? Page 552.
5. What are the clinical signs of thallium intoxication of dogs and what therapy was shown to be most beneficial? Page 547.
6. How many SPF (specific pathogen-free) herds of swine are expected to be established in the United States in 1960? Page 561.

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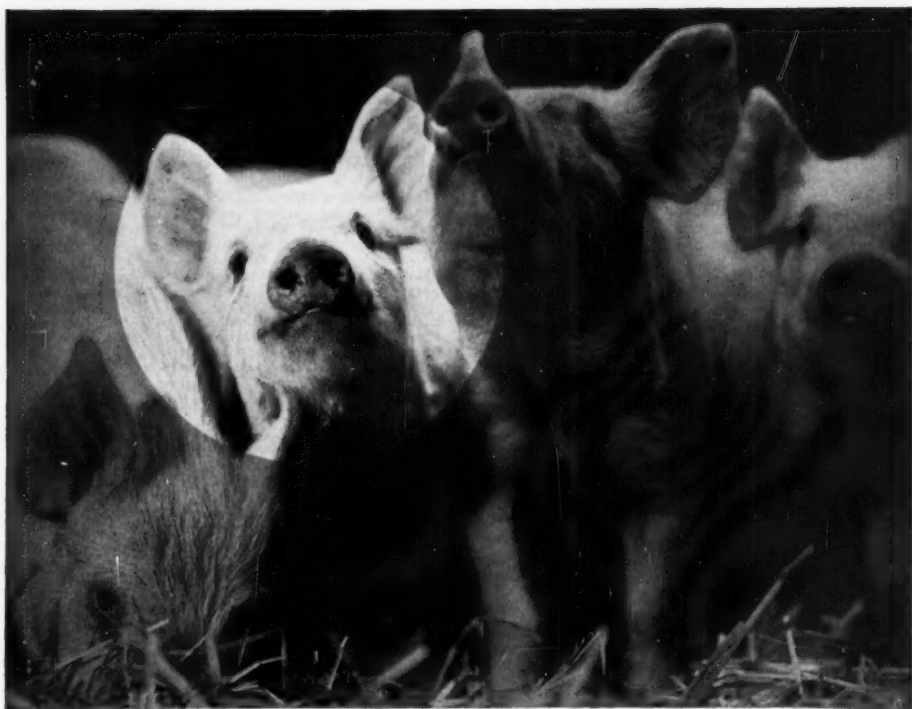
Hugus and Knuth, 1680 Mission St.

San Francisco 3, California

Expenditures for Animal Health

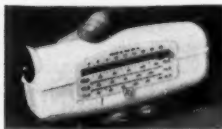
Civilian spending for livestock, poultry, and pet health aids in 1959 was \$245,690,000, according to *Drug Topics'* 18th annual Market Report for Livestock, Poultry, and Pet Health Aids. The 1959 figure exceeded the 1958 total by nearly \$11,000,000. Over \$80,000,000 worth of these items were obtained through drugstore outlets.

Total expenditures for the various animal health preparations, excluding those sold to government agencies, are as follows: veterinary biological products, \$73,230,000 (for livestock use, \$51,730,000; for poultry use, \$16,920,000; for pet use, \$4,580,000); other livestock preparations, \$102,230,000; other poultry preparations, \$36,930,000; other dog and pet medicaments, \$15,210,000 (body parasiticides for external application, \$3,860,000; worming products, \$2,030,000; nutritional products, \$5,060,000; all other, \$4,260,000); dips, insecticides, \$16,600,000 (body parasiticides for external application to livestock and poultry, \$10,460,000; insecticides, dips for use on premises occupied by livestock and poultry, \$6,140,000); and veterinary instruments, \$1,490,000.—*Drug Trade News*, 35, (July 25, 1960): 16.



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As more and more farmers turn to the efficiency of confinement raising of swine on concrete or frozen ground, the problem of swine anemia becomes greater and greater. The very method, in a sense, carries its own curse . . . because the pigs no longer wallow in the earth this source of



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Coming Meetings

Notices of coming meetings must be received 30 days before date of publication.

American Animal Hospital Association. Regional Meetings. Dr. Frank R. Booth, 3920 E. Jackson Blvd., Elkhart, Ind., executive secretary.

Region 1. Royal York Hotel, Toronto, Can., Nov. 2-3, 1960. Roosevelt Hotel, Pittsburgh, Pa., Jan. 15, 1961. Shoreham Hotel, Washington, D. C., Feb. 8-10, 1961. Buffalo Academy of Veterinary Medicine, Buffalo, N.Y., March 16, 1961.

Region 2. Buena Vista Hotel, Biloxi, Miss., Feb. 11-13, 1961. Miami Regional, Miami, Fla., Feb., 1961.

Region 3. Hotel President, Kansas City, Mo., Oct. 20, 1960. Hotel Burlington, Burlington, Iowa, Nov. 16-17, 1960. Commodore Perry Hotel, Toledo, Ohio, Nov. 30, 1960.

Region 4. Oklahoma State University, Stillwater, Okla., Jan. 22, 1961. Texas V.M.A. Meeting, Houston, Texas, Jan. 30, 1961. Colorado State University, Fort Collins, Col., Feb. 19, 1961.

Cornell University. Annual nutrition conference for feed manufacturers. Statler Hilton Hotel, Buffalo, N.Y., Nov. 2-4, 1960. For programs, preregistration and hotel reservation cards, contact: Prof. Harold H. Williams, Savage Hall, Cornell University, Ithaca, N.Y., chairman.

Ohio—Orthopedic Workshop and Seminar. Northern Hills Animal Clinic, 9211 Winston Rd., Cincinnati, Ohio. Nov. 4-6, 1960. Fee, \$50. Attendance limit, 14. Dr. Richard Rudy, Ohio State University, Veterinary Surgery and Radiology, Columbus, Ohio, chairman.

Missouri, University of. Thirty-sixth annual veterinary conference. University of Missouri, School of Veterinary Medicine, Columbia, Mo., Nov. 7-8, 1960. Cecil Elder, School of Veterinary Medicine, Veterinary Pathology, University of Missouri, chairman.

Arizona Veterinary Medical Association. Annual meeting. Safari Hotel, Scottsdale, Ariz., Nov. 13-15, 1960. Elmer B. Powell, 1102 S. Scottsdale Rd., Scottsdale, Ariz., local arrangement (phone—WH 5-6479).

Central Indiana Veterinary Association. Fifth Regional Conference on the Nitrofurans in Veterinary Medicine. Co-sponsored with Eaton Laboratories. Sheraton-Lincoln Hotel, Indianapolis, Ind., Nov. 16, 1960. Dr. Charles Stengel, 3230 Winfield Ave., Indianapolis, Ind., president.

Midwest Small Animal Association. Hotel Burlington, Burlington, Iowa, Nov. 16-17, 1960. Dr. J. Porter Coble, 2828 S. MacArthur Blvd., Springfield, Ill., secretary.

Kentucky Veterinary Medical Association. Sterility Short Course. Phoenix Hotel, Lexington, Ky., Dec. 5-6, 1960. Dr. L. S. Shirrell, 545 East Main, Frankfort, Ky., secretary.

American Association of Equine Practitioners. Annual meeting. Westward Ho Hotel, Phoenix, Ariz., Dec. 12-14, 1960. Dr. M. B. Teigland, 2560 State Service Rd., Opa Locka, Fla., secretary-treasurer.

Veterinary-Nutrition Conference. Sponsored by Midwest Feed Manufacturers Association and Iowa, Kansas, Missouri, Oklahoma, and Nebraska Veterinary Medical Associations. Continental Hotel, Kansas City, Mo., Dec. 12-13, 1960. Dr. James Bailey, Walnut Grove Products Co., Atlantic, Iowa, chairman.

American Veterinary Radiology Society. Mid-year meeting. Hotel Severin, Indianapolis, Ind., Jan. 10, 1961. Dr. J. J. Fishler, 3421 S. Main St., Elkhart, Ind., secretary.

Intermountain Veterinary Medical Association. Thirty-third annual meeting. Newhouse Hotel, Salt Lake City, Utah, Jan. 11-14 1961. Mr. Peter B. Woolley, 306 Ness Building, 28 West Second South, Salt Lake City, Utah, manager.

Kansas Veterinary Medical Association. Fifty-seventh annual convention. Broadview Hotel, Wichita, Jan. 15-17, 1961. Dr. M. W. Osburn, Kansas State University, Division of Extension, Manhattan, Kan., secretary-treasurer.

Wisconsin Veterinary Medical Association. Forty-fifth annual meeting. Schroeder Hotel, Milwaukee, Wis., Jan. 15-17, 1961. W. J. O'Rourke, 540 W. Washington Ave., Madison 3, Wis., secretary.

Arkansas Veterinary Medical Association. Annual meeting. Hotel Marion, Little Rock, Jan. 22-24, 1961. Thayer D. Hendrickson, 7824 Cantrell Rd., Little Rock, Ark., secretary-treasurer.

Minnesota Veterinary Medical Association. Annual meeting. Leamington Hotel, Minneapolis, Minn., Jan. 23-25, 1961. B. S. Pomeroy, 1443 Raymond Ave., St. Paul 8, Minn., secretary.

Ontario Veterinary Association. Eighty-seventh annual meeting. Royal York Hotel, Toronto, Ont., Jan. 26-28, 1961. Dr. R. J. Humble, Ontario Veterinary College, Guelph, Ont., chairman.

Ohio State Veterinary Medical Association. Annual meeting. Commodore Perry Hotel, Toledo, Ohio, Feb. 5-8, 1961. Dr. R. E. Rebrassier, 1411 West Third Ave., Columbus 12, Ohio, executive secretary.

Missouri Veterinary Medical Association. Sixty-ninth annual meeting. Hotel Statler-Hilton, St. Louis, Feb. 19-21, 1961. Paul L. Spencer, D.V.M., P.O. Box 283, Jefferson City, Mo., secretary.

Illinois State Veterinary Medical Association. Annual meeting. LaSalle Hotel, Chicago, Ill., Feb. 20-22, 1961. Dr. C. B. Hostetler, 1385 Whitcomb Avenue, Des Plaines, Illinois, executive secretary.

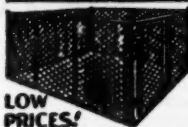
Alabama Veterinary Medical Association. Annual meeting. Whitley Hotel, Montgomery, Ala., March 19-21, 1961. Dr. M. K. Heath, School of Veterinary Medicine, Auburn, Ala., secretary.

Electrocardiograms May Aid Determination of Racing Potential

Studies are underway to determine the value of electrocardiograms for scoring and evaluating the racing potential of Thoroughbred horses. However, those who have studied the problem most intimately seem to agree that the racing ability of a horse depends upon many factors and that the condition of the heart alone is not likely to be a certain indicator of racing potential.

In this country, electrocardiographic studies have been conducted at Cornell University and at Belmont Park under the direction of Dr. W. H. Wright. — *The Blood Horse*, 80, (July 2, 1960): 42.

PORTABLE DOG PENS



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Sectional design, permanent or portable. Strong, rugged. Long life. Welded galvanized pipe frame. Chain link fence. Discourages climbing. Improves ventilation, cleanliness. Less disease. Designed and built for your purpose. Send sketch and size. Freight paid. Write for circular and prices.

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Foreign Meetings

Fourth International Congress on Animal Reproduction. The Hague, Netherlands, June 5-9, 1961. For additional information contact: the Secretariat of the Fourth International Congress on Animal Reproduction, 14, Burgemeester de Monchyplein, The Hague, Netherlands, Dr. L. Hoedemaker, secretary to the organizing committee.

Eighth International Congress of Animal Husbandry. Hamburg, Germany, June 13, 1961.

Twelfth World's Poultry Congress. Show Grounds of the New South Wales Royal Agricultural Society, Sydney, Australia, Aug. 13-18, 1962. Dr. Cliff D. Carpenter, chairman, U. S. Participation Committee, 1207 Emerald Bay, Laguna Beach, Calif.; Dr. A. William Jasper, secretary, c/o AFBF, 2300 Merchandise Mart, Chicago 54, Ill.

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Flame and smoke turned a kennel into a death chamber yesterday and killed 53 pedigreed dogs . . . worth from \$75 to \$350 each.

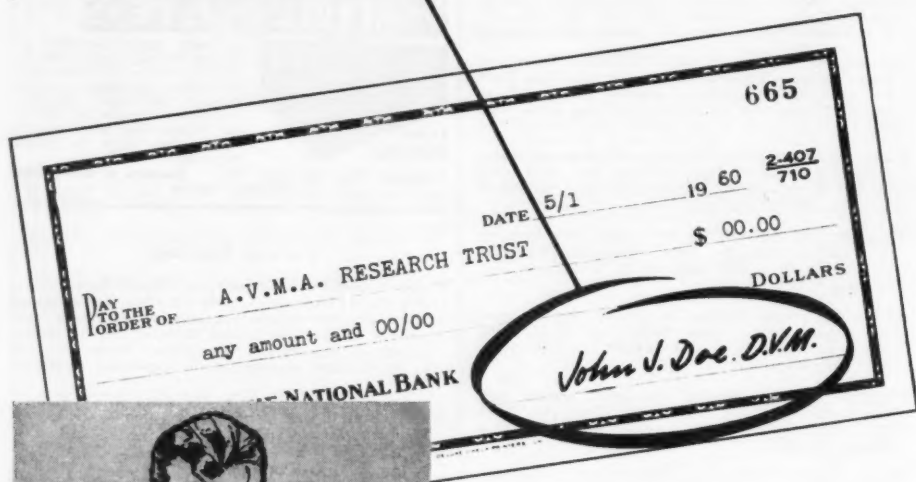
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Puddles, Poodles, and Problems

A human interest story, particularly for dog lovers, reached the archives of legal literature when an insurance company brought an action for declaratory judgment to determine liability on a personal property floater policy. Andre, a French Poodle, was purchased upon the representation that he was properly trained and "broke." Andre was guilty of misfeasance in the living room, dining room, and hall, to the extent that damages to carpeting in the amount of \$7,500 were claimed by the owner. While the insurance adjuster surveyed the effects, it is reported that Andre gave a command performance! The Court held, on the question of coverage, that the law had always allowed each dog its first bite, for then the owner is put on notice of its dangerous tendencies. In this case, the Court would have indulged the rule to 1 or 2 more incidents under the circumstances in order to give the insured some opportunity for discovery, and the Court added: "But, to allow such prolific indiscretions, ad infinitum, is beyond credulity and borders onto wanton recklessness and disregard, for which a person should not be rewarded."

The Court concluded with a literary gem: "So, while we love our dogs, let it be the law that we don't collect for so many puddles made by Poodles, even under the 'floater' provisions of a policy with 'maritime' law as precedent . . . and to the beloved French Poodle, the proximate cause of this litigation and discourse, I say 'Paix a'tu aussi, Andre.'" (Aetna v. Sachs, No. 58 C 18 (3).) —*Insurance News-o-Gram*; abstr. in *Veterinarian*, Off. Pub. of Massachusetts V.M.A., 5, (July, 1960): 18.

New Device to Safeguard Animals During Surgery

A more accurate check on the heart condition of animals undergoing surgery can now be kept through the use of a new device that records electrical impulses of the heartbeat.

The instrument transmits "beeping" signals that report the electric-wave activity of the heart. It gives a quicker and more accurate indication of the animals' heart condition than can be obtained by monitoring only the sound of heartbeat, the blood pressure or the pulse, reports Robert W.

Burmeister, head of Chemetron Corporation's National Cylinder Gas Medical Equipment Department.

The veterinarian performing surgery and his assistants listen for interruptions or



The pup is listening to the "beeping" signals of her heartbeat coming from the electronic heart monitor in the foreground. Two needles attached to her paws and to the monitor transmit the electric-wave activity of her heart.

changes in the signal since this warns of heart disturbances or cardiac arrest. If the signal changes, everyone in the room is instantly aware of the possible need for injection of stimulents, administration of oxygen, heart message, electrical shock or other lifesaving measures.

The device weighs only 6 oz. and is less than 5 inches long. It was invented by Dr. William F. Veling, a Detroit surgeon, to solve a problem existing during operations on man.

Research Trust Donation

The trustees and officers of the Schering Foundation, Inc., of Bloomfield, N. J., recently donated \$2,500 to the AVMA Research Trust. Money from the Research Fund has been used exclusively to maintain the AVMA Fellowship Program.



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Wanted—Veterinarians

Wanted—veterinarian for progressive and expanding mixed practice in western Pennsylvania. Can lead to partnership or purchase. License not required to start. Address Box L 21, JOURNAL of the AVMA.

Wanted—veterinarian to assist in small and large animal practice, predominantly small animal. Hospital located in Phoenix area. Address Box L 20, JOURNAL of the AVMA.

Wanted—assistant veterinarian for small animal practice. State qualifications and salary requirements. Connecticut license required. Address Drs. M. H. Ryan and R. A. Rands, Davis Animal Hospital, West Main St., Stamford, Conn.



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Wanted—veterinarian for small animal practice in New Jersey. Starting salary—\$8,000. State qualifications and personal background. Address Box L 22, JOURNAL of the AVMA.

Wanted—the Agricultural Division of American Cyanamid Company is seeking a veterinarian with 3 to 5 years' experience with large animals and poultry, to locate at our Agricultural Center in Princeton, N. J. Responsible for design of clinical, laboratory and field trials, analyzing experimental results and making recommendations for terminating or expanding experiments leading to new veterinary products. Address Personnel Relations, Agricultural Division, American Cyanamid Company, P. O. Box 672, Princeton, N. Y.

Wanted—assistant veterinarian for well-established suburban small animal practice. Apartment available. Desirable Ohio location. Address Box L 18, JOURNAL of the AVMA.

Wanted—recent graduate to assist in modern, well-equipped small animal hospital. Some large animal. Located in large Southern city. Salary commensurate with ability. Address Box L 16, JOURNAL of the AVMA.

Wanted—The Agricultural Division, American Cyanamid Company, is seeking a veterinarian with 2 to 5 years' experience for the position of regional technical service representative in the Southwest Region with headquarters in Dallas, Texas. Responsible for promotion and service of technical programs. Address Personnel Relations, Agricultural Division, American Cyanamid Company, P. O. Box 672, Princeton, N. Y.

Wanted—veterinarian for young, growing small animal practice in northern Indiana. Salary plus percentage. Good future for right party. State qualifications, age, and availability. Address Box L 15, JOURNAL of the AVMA.

Wanted—veterinarian interested in a career of teaching and research in anatomy, to give fewer than 20 hours of laboratory instruction per week. Graduate study in gross, microscopic, developmental, or neuroanatomy. Descriptive or experimental research. Send transcript of college record with first letter. Address Department of Anatomy, New York State Veterinary College, Ithaca.

Wanted—assistant for mixed practice in Missouri. Opportunity for ownership by right party. State experience and salary expected in first letter. Address Box L 26, JOURNAL of the AVMA.

Fine opportunity for qualified small animal veterinarian in large hospital. Massachusetts license required. Good hours. Salary commensurate with experience, background, and training. Insurance and retirement benefits. Annual paid vacation and sick leave. Living quarters furnished for single man or woman. Write stating experience and qualifications. Address Box L 25, JOURNAL of the AVMA.

Wanted—experienced veterinarian for small animal practice. Good starting salary. State experience and background. Virginia license required. Address Box L 3, JOURNAL of the AVMA.

Continued on adv. p. 52.

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Return a Frolicking Pet to Its Grateful Owner: A single intramuscular dose generally reduces inflammation, relieves itching, and promotes repair of painful lesions in canine dermatitis.¹⁻³ Duration of therapeutic action is "disciplined": persists 5 to 10 days,^{1,2} long enough to give these desirable results, but not so long as to cause complications. Additional injections are usually unnecessary.¹⁻³

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SUPPLIED: Multiple-dose Vials, 10 ml., each ml. containing 10 mg. or 25 mg. prednisolone trimethylacetate in suspension for intramuscular injection.

References: 1. Pollock, S.: Vet. Med. 54:97 (Feb.) 1959. 2. Hoffer, S. H.: Clinical report to CIBA. 3. Weir, H. T., and Hazelrig, J. W.: Clinical report to CIBA.

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Continued from adv. p. 50.

Wanted—veterinarian for mixed practice in central Iowa. Must be available within 60 days. Please state experience and family status in first letter. Partnership possibilities for the right man. Address Box L 8, JOURNAL of the AVMA.

Wanted—veterinarian for small animal hospital. Some experience preferred. Good hours, excellent working conditions, pleasant clientele. Salary—\$125 to \$150 a week, depending on qualifications. Opening now. Midwest city. Address Box L 11, JOURNAL of the AVMA.

Wanted—veterinarian to operate mixed practice in northern Illinois. State qualifications and salary expected. Address Box L 14, JOURNAL of the AVMA.

Wanted—assistant for mixed practice in Delaware. Convenient living facilities. Excellent opportunity for right person to buy into practice in the future. Salary and commission. Please state age, experience, availability and other qualifications. Married man preferred. Address Box L 9, JOURNAL of the AVMA.

Wanted—Positions

Graduate (OVC), age 32, married, desires position as sales manager with progressive ethical drug firm in Canada. Experienced in sales promotion, 5 years in busy swine, dairy and small animal practice in Ontario. Address Box L 24, JOURNAL of the AVMA.

Veterinarian, age 30, interested in institutional or commercial field. Holds B.S. animal husbandry degree and general practice experience. Address Box L 23, JOURNAL of the AVMA.

Veterinarian desires position or to lease small or mixed animal practice in Wisconsin or northern Illinois. Address Box L 17, JOURNAL of the AVMA.

Graduate (AUB '54) married, experienced, desires position in small animal practice in or near large city that could lead to partnership, lease or purchase. Licensed in Tennessee, Georgia, Alabama. Address P. O. Box 266, Madison, Tenn.

For Sale or Lease—Practices

For sale—50 percent small animal practice and hospital. Large inventory. Walk-out price less than 1 year's gross. Southern Kansas. Address Charles E. Doyle, D.V.M., practice broker, 4813 N. McArthur, Oklahoma City, Okla.

For sale or lease—new home and small animal hospital in southern Michigan. 70 percent large animal. Address Box K 54, JOURNAL of the AVMA.

For lease—Virginia mixed practice, fully-equipped, air-conditioned, 45-cage hospital with outside runs, living quarters. Low down payment and terms. Require license. Outside interests compel leasing. Replies confidential. Address Box L 6, JOURNAL of the AVMA.

For sale—Virginia mixed practice, equipped animal hospital, apartment, 2-way radio. Gross—\$25,000. License required. Attractive price, terms. Address Box L 4, JOURNAL of the AVMA.

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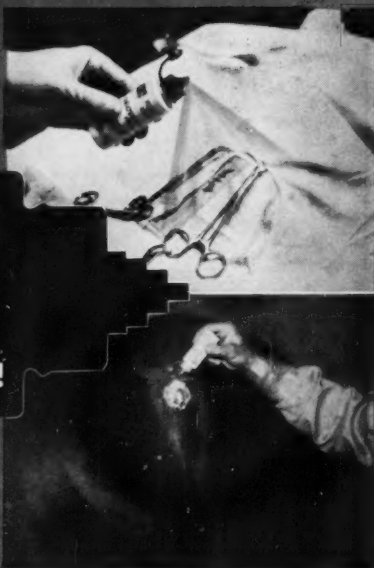
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